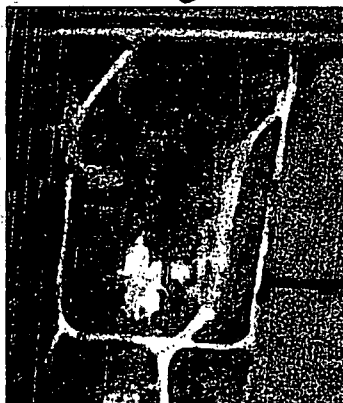


ORIGINAL

**EXPANDED SITE INSPECTION
OF THE
ELKTON FARM FIREHOLE SITE OU-2**

(MD-425)

533



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1.0 INTRODUCTION

1.1 Authorization

This Expanded Site Inspection (ESI) was performed by the Maryland Department of the Environment, Waste Management Administration (MDE/WAS), Environmental Restoration and Redevelopment Program (ERRP), Federal Superfund Division under the Preremedial Cooperative Agreement with the U.S. Environmental Protection Agency (EPA).

1.2 Scope of Work

MDE was contracted to perform an ESI of the Elkton Farm Firehole Site (MD-433). The purpose of the ESI is to assess the actual and potential release of hazardous substances from the site by way of groundwater, surface water, soil exposure and air pathways on sites that were owned and/or operated by the Federal Government. The scope of the ESI included reviewing the available file information, site reconnaissance and sampling under the U.S. EPA Contract Laboratory Program (CLP).

1.3 Executive Summary and Conclusions

The Elkton Farm Firehole site is located two miles northwest of Elkton, Maryland near the intersection of Routes 40 and 279 (Figure 1). The Firehole property occupies approximately 32 acres of the 400-acre Elkton Farm and is located just south of Zeitler Road between Little Elk Creek and Laurel Run. The most recent use of the site has been as a working farm. During the decade before and during World War II, the parcel had been the site of activity related to the manufacture of fireworks and munitions.

After being identified as a potentially responsible party, the U.S. Army Corps of Engineers (the Corps) contracted with TechLaw, Inc. to conduct an investigation of the site operations and ownership history of the Elkton, Maryland site of Triumph Explosives, Inc. (TEI). TechLaw completed this investigation in February 1992, and submitted a final report to the Corps. This report identified an area on the current Elkton Farm as the Firehole. The Firehole was documented as an area for the disposal of waste explosives material. This waste was reportedly collected in drums and kept wetted with alcohol or ether. This waste was then carried to a shallow pit off Zeitler Road, spread thinly and allowed to burn. Plant personnel monitored the burn until the waste explosive was ostensibly consumed. Photographs in the TEI newsletter from the period of concern show the operation of this Firehole burn pit.

The total quantity of hazardous waste disposed of in the Firehole is unknown. There is no estimate of fill thickness for the Firehole. A geophysical survey conducted for MDE by NAEVA Geophysics, Inc. (NAEVA) indicated several distinct anomalies on the portion of the

property east of Laurel Run and south of Zeitler Road. Observations indicate that the Firehole is not one discrete area but rather a series of burn pits located across the property in an approximate 32-acre area.

The Firehole area was reportedly the subject of a cleanup that saw the removal of tens of tons of contaminated soil. According to two separate sources, Mr. Patrick Herron and Mr. Richard Herron, soil was removed from an area where crops would not grow, and clean soil was brought in to fill the excavation. The removed soil was said to have contained scraps of brass shell casing and metallic slag.

A sampling plan to characterize the four anomalies found on the 32-acre site, as defined by the NAEVA geophysical survey, was prepared by MDE. On December 14, 2004 and January 11 & 12, 2005, as part of the ESI, MDE collected twelve surface soil samples, and twelve subsurface soil samples by remote geoprobe. The samples were analyzed for the presence of metals and cyanide, volatile organic compounds (VOC), perchlorates and nitroaromatic compounds.

A Toxicological evaluation was prepared for the Firehole site, assuming residential future use scenario for the site. EPA recognizes an acceptable Hazard Index of values less than or equal to one (noncarcinogenic chemicals) and a lifetime cancer risk less than or equal to 10^{-6} to 10^{-4} . MDE recognizes threshold Hazard Index values equal to one and lifetime cancer risk threshold values less than or equal to 1×10^{-5} . Risk estimates exceeded EPA and MDE recommended levels for the child resident population for incidental ingestion of surface soils, with the risk drivers of arsenic, copper, iron, thallium and 2,4,6-trinitrotoluene (TNT). Risk estimates exceeded EPA and MDE recommended levels for the child resident population for dermal contact with surface and subsurface soils, with the risk drivers of chromium and vanadium. Concentrations detected exceeded the EPA and MDE recommended levels for ingestion of surface soil for the youth resident, adult resident, and construction worker with the risk drivers of 2,4,6-TNT. Lead was detected in elevated levels across the site. The subsurface sample collected at SS5 contained 2860 mg/kg of lead, which may pose a threat to sensitive populations and the environment.

Samples S/SS1, S/SS2, S/SS3, S/SS5 and S/SS12, were collected from Pit A, the northernmost firehole anomaly defined by the NAEVA geophysical survey. Subsurface soil samples from Pit A were collected at 18 to 24 inches below the ground surface in a layer of dark vitrified material with entrained waste explosive devices. Sample analysis for soils collected from Pit A showed elevated concentrations of lead, zinc, mercury, and arsenic, trichloroethene (TCE), and TNT and associated daughter products. Samples S/SS 6 and S/SS7 were obtained from Pit T located on the northeast corner of the Thiokol Motor Recovery Area (TMRA). Sample analysis for soils collected from Pit T showed elevated concentrations of heavy metals and TNT and its associated daughter products. Samples S/SS8 and S/SS9 were collected from Pit N, an anomaly documented by the NAEVA survey in the southern extreme of the Firehole acreage. Samples from Pit N were relatively free from the volatile and nitroaromatic contaminants documented in Pits A and T. Samples S/SS10 and S/SS11 were collected from Pit C, an anomaly on the eastern edge of the gravel access road midway between Zeitler Road and

the TMRA. Samples collected from Pit C showed elevated concentrations of a number of heavy metals, but were relatively free from the volatile and nitroaromatic contaminants documented in Pits A and T.

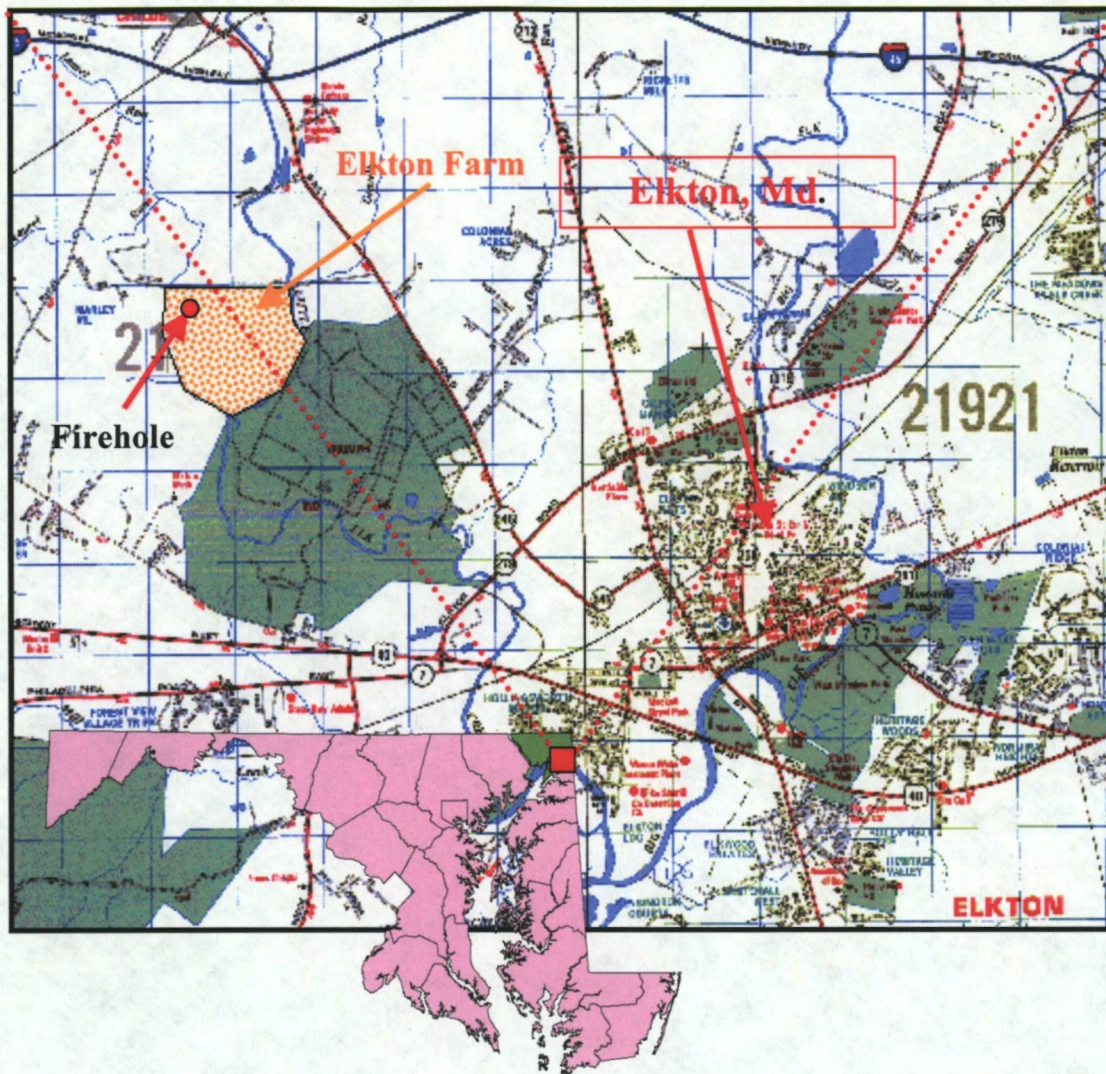
The Elkton Farm property is for sale on the real estate market. The tillable acreage of the farm is currently leased to Spry Brothers Farming for seasonal crops; however, in all likelihood, the entire 400-acre farm will be developed for residential use in the future, rather than continue to be farmed. The presence of waste ordnance, TNT and daughter products, elevated concentrations of heavy metals, and TCE detected in site soils, and the presence of ordnance-related debris easily observable on the ground surface all suggest that further action is necessary in order to mitigate human health risks to future residential populations.

2.0 SITE DESCRIPTION

The Elkton Farm site is located at 183 Zeitler Road, Elkton, Cecil County, Maryland (Figure 1). The farm itself consists of approximately 400 acres and is situated in a rural setting just north of Triumph Industrial Park. MARVA Limited Partnership currently owns the farm, however Windsor Management, Inc. has optioned the farm for future development. The property has historically been a working farm. For a brief period between 1943 and 1947, the property was impacted by military operations. MARVA Limited Partnership, the current owner, leases the property to a commercial farming operation that continues to rotate several seasonal crops through the Elkton Farm's fields. There are no access limitations to this property.

The "Firehole" is the result of military-directed operations in the 1940s, where waste explosives were disposed through open burning.

Figure 1 - Regional and Local Map



This report addresses Operational Unit Two of the Firehole investigation. The Firehole parcel is located on the U. S. Geological Survey (USGS) Bayview/Newark West quadrangles at approximately 39°38' north latitude and 75°53' west longitude and has a Maryland grid coordinate of 655,000 N and 1,117,500 E. The roughly triangular 32-acre site is bounded on the west by Laurel Run, to the north by Zeitler Road, and to the east by Little Elk Creek (Figure 2). A gravel access road bisects the western quadrant of the site. The Firehole is in this western quadrant west of the gravel road. Land use surrounding the site is primarily agricultural/residential, with an area of medium to light industry property to the southeast across Little Elk Creek.

Figure 2 – Topographical Map with Highlighted Area of Concern.



2.1 Site Ownership and Use

Throughout most of its history, Elkton Farm has been used as a livestock farm with much of the surrounding fields under cultivation. During the early 1940s, Triumph Explosives Inc. acquired ownership of the Elkton Farm. During the period between the end of World War II and the 1970s, hazardous material was stored and/or disposed of on the farm.

TEI purchased the Elkton Farm property in the early 1940s. The current owners, the Herron Family/MARVA Ltd. Partnership, acquired the property in 1948. In the late 1950s and early 1960s, the Thiokol Corporation leased a one-acre plot of the property. The farm property is currently leased to a commercial farming operation that rotates seasonal crops through the fields.

2.2 Permitting and Regulatory Actions

There are no permits on file with MDE for the disposal of waste material at the Elkton Farm site, however as a working farm, they were at one time allowed to operate a dump for farm-related debris.

2.3 Remedial Actions

There have been no remedial actions conducted in the area of the Firehole.

3.0 ENVIRONMENTAL SETTING

3.1 Water Supply

Drinking water for the Elkton area is obtained from an intake on Big Elk Creek and two municipal production wells. The total amount of municipal water withdrawn from these three sources is estimated to be 1.7 million gallons per day. The two municipal production wells are within the four-mile radius of the site. One production well is within the one-half to one-mile ring and the other is within the one to two-mile ring. These two wells are estimated to serve the population within four miles of the site; 800 and 22,700 people respectively. The estimated number of domestic wells and non-transient non-community wells and populations they serve is represented in the following table. The closest well to the Firehole site is located at the Elkton Farm farmhouse, 1300 feet northeast of the intersection of Zeitler Road and Fisher Lane, at 183 Zeitler Road.

Table 1 – Domestic Water Sources within a Four-Mile Radius of Site.

ESTIMATE NUMBER OF DOMESTIC WELLS	ESTIMATED POPULATION SERVED*	RING DISTANCE FROM THE SITE	COMMUNITY AND NONTRANSIENT NONCOMMUNITY SYSTEMS	ESTIMATED POPULATION SERVED
5	15	0 – ¼ mile		
25	65	¼ – ½ mile	1	800
70	183	½ - 1 mile		
237	621	1 – 2 miles	1	22700
176	461	2 – 3 miles		
287	752	3 – 4 miles		
800	2096	Total	2	23500

*According to 1998 U.S. Census data, the average population per household is 2.62.

3.2 Surface Waters

The Elkton Farm property lays at the confluence of Little Elk Creek with Laurel Run. Natural drainage on the site is in a generalized north to south direction. There is a slight drainage divide on the property which directs surface runoff to either Laurel Run or Little Elk Creek. Surface water infiltrates the soil to groundwater, or is discharged via overland flow to Laurel Run or Little Elk Creek. Laurel Run discharges into Little Elk Creek which flows southward into Big Elk Creek and eventually to the Chesapeake Bay.

The farthest upstream probable point of entry for the surface water route originates at the on-site drainage ditch on the Zeitler Road border of the site. The drainage ditch travels west for approximately 500 feet before emptying into Laurel Run, a perennial freshwater stream and a fishery. Laurel Run flows 0.625 mile to its confluence with Little Elk Creek. The area of the confluence of Laurel Run and Little Elk Creek is classified as Palustrine Aquatic Bed wetlands. Little Elk Creek flows south southeast for approximately four miles before emptying into the Big Elk Creek. Big Elk Creek flows approximately 2.25 miles to the point where it empties into Elk River. Elk River flows approximately 12 miles to its confluence with the Chesapeake Bay. The 15-mile surface migration pathway ends in the Elk River three miles from the confluence of Elk River with the Chesapeake Bay. The Elk River is classified as Estuarine intertidal wetlands and is a fishery.

3.3 Soils

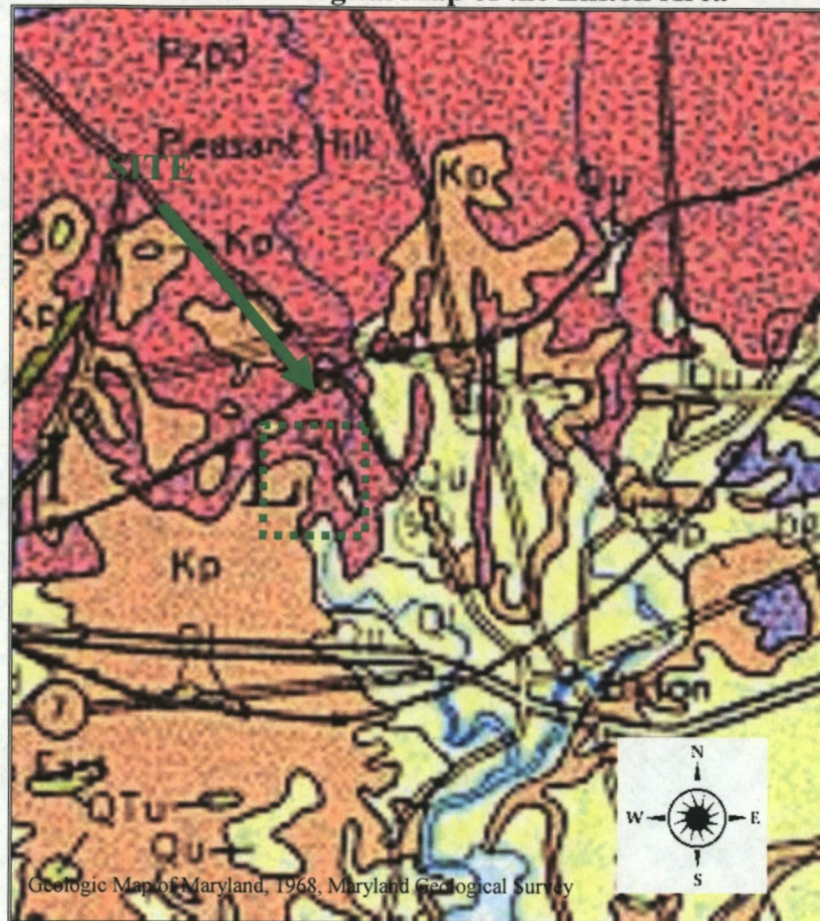
Elkton Farm's soils are characterized as having been formed in the soft unconsolidated, water-lain Cretaceous and Pleistocene sediment of the Atlantic Coastal Plain. The soil series found on the Elkton Farm are a combination of Elsinboro, Mattapex, and Othello silt loams all having slopes of less than five percent. Eisenboro series soils are deep, well drained soils found on terraces above the flood plains of major streams. Eisenboro soils are formed in old alluvium and contain considerable amounts of fine mica flakes. Mattapex soils consist of deep moderately well drained loamy soils that formed in silty material laid down on older, coarser sediment. Othello series soils are poorly drained loamy soils on upland flats. These soils were formed in silty material underlain by coarser sediment. Most of the hardwood vegetation native to these three soil series are noted to have been cleared for use as cropland.

3.4 Geology and Groundwater

Elkton Farm lies in the erosional remnants of the Coastal Plain Physiographic Province, near the Fall Line. The unconsolidated sediments of the Coastal Plain extend eastward from the Fall Line, dipping eastward and becoming progressively thicker with distance, eventually reaching over 8,000 feet in thickness at Ocean City.

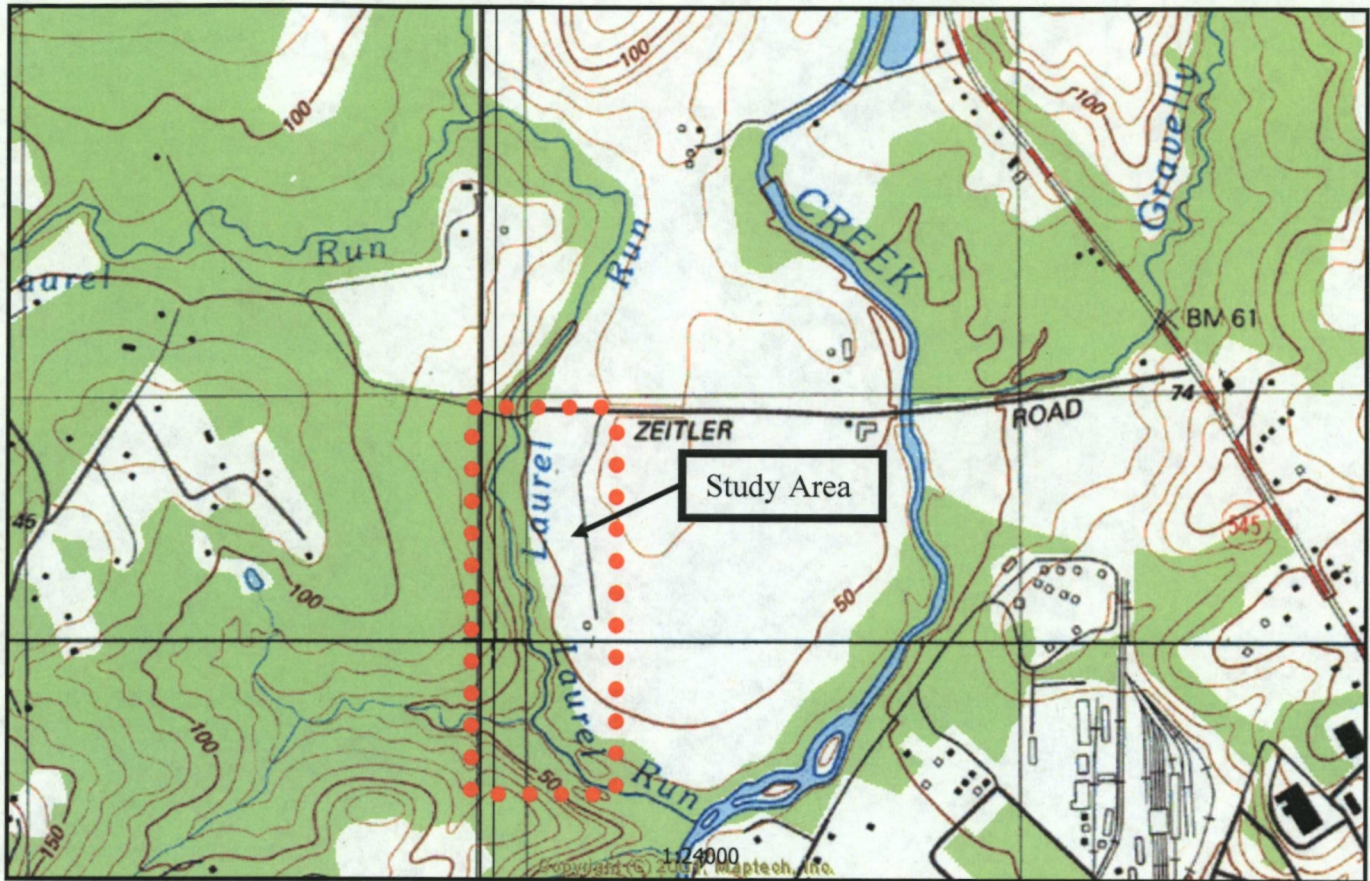
The quaternary strata at the Elkton Farm Firehole site (Figure 3) is classified as Uplands Deposits, which includes the Pamlico, Talbot, Wicomico and Sunderland Formations of earlier reports. The Uplands Deposits consists of a floodplain deposited formation comprising lenses of micaceous sand and gravel interbedded with thin layers of silt and fine sand. The coarse-grained sands and gravels at the base of the formation can range in size to boulders eight feet in diameter.

The groundwater component at the Firehole was defined in an earlier sampling. Four 2-inch monitoring wells set at between 20 to 30 feet below ground surface were installed in March 2003 to monitor groundwater at the site. These wells defined the localized groundwater flow as being to the south-southwest.

FIGURE 3 – Generalized Geological Map of the Elkton Area

Ql	Lowland Deposits -Gravel, sand, silt and clay. Medium- to coarse-grained sand and gravel; cobbles and boulders near base; commonly contains reworked Eocene glauconite; varicolored silts and clays; brown to dark gray lignitic silty clay; contains estuarine to marine fauna in some areas (includes in part Pamlico, Talbot, Wicomico and Sunderland Formations of earlier reports); thickness 0 to 150 feet
Qu	Upland Deposits (Eastern Shore) - Gravel, sand, silt, and clay. Mostly cross-bedded, poorly sorted, medium- to coarse-grained white to red sand and gravel, boulders near base; minor pink and yellow silts and clays; (Wicomico Formation of earlier reports); thickness 0 to 90 feet, locally thicker in paleochannels.
QTu	Upland Deposits (Western Shore) - Gravel and sand, commonly orange-brown, locally limonite-cemented; minor silt and red, white, or gray clay; (includes Brandywine, Bryn Mawr, and Sunderland Formations of earlier reports); lower gravel member and upper loam member in Southern Maryland; thickness 0 to 50 feet
Kp	Potomac Group - Interbedded quartzose gravels; protoquartzitic to orthoquartzitic argillaceous sands; and white, dark gray and multicolored silts and clays; thickness 0 to 800 feet.
Pzpd	Port Deposit Gneiss - Moderately to strongly deformed intrusive complex composed of gneissic biotite quartz diorite, hornblende-biotite quartz diorite, and biotite granodiorite; all rocks foliated and some strongly sheared; age 550 +/- 50 m.y.* by radiogenic dating.

Figure 4 – Topographic Map



3.6 Meteorology

The climate is temperate and humid with an average of 180 freeze-free days. The average temperatures range from 74.1 degrees Fahrenheit in the Summer to 34 degrees Fahrenheit in the Winter. The mean annual precipitation is about 45.3 inches with an average snowfall on the order of 18 inches per year.

3.7 Nearby Land Use and Population Distribution

Land use surrounding the site is primarily agricultural/residential, with an area of medium to light industry situated to the southeast across Little Elk Creek. There are four residences located along Zeitler road. The two closest to the study area, which were directly associated with the historic farming operation, are currently occupied. The Triumph Industrial Park is located a short distance south of the intersection of Zeitler Road and Blue Ball Road (MD RT-545). Triumph Industrial Park is located on the site of, but is unrelated to, the former TEI operation. Several industrial and chemical operations, including GE Railcar, and Thiokol Corporation, now occupy space in the industrial park.

Table 2 – Population Distribution

Radius (miles)	Population
0 – 0.25	134
0.25 – 0.5	217
0.5 – 1.0	672
1.0-2.0	5001
2.0 – 3.0	9581
3.0 – 4.0	11,451
Total	27,056

The resident population distribution around the site was determined using Maryland census figures for the year 2000.

4.0 WASTE DESCRIPTION

After being identified as a potentially responsible party, the Corps contracted with TechLaw, Inc. to conduct an investigation of the site operations and ownership history of the Elkton, Maryland site of TEI. In February 1992, the final report for this project was prepared by TechLaw, Inc. This report identified an area on the Elkton Farm as the Firehole. This Firehole was documented as an area for the disposal of waste material from the manufacture of explosive ordnance. This waste material was reportedly collected in drums and kept wetted with alcohol or ether. The waste was then carried to a shallow pit off Zeitler Road, spread thinly and allowed to burn. Plant personnel monitored the burn until the waste explosive was ostensibly consumed. The TEI newsletter from the period of shows photographs of the operation of this Firehole burn pit and reports on an explosion and resulting injuries at the Firehole.

The total quantity of hazardous waste disposed of in the Firehole is unknown. There is no estimate of fill thickness for the Firehole. A geotechnical survey conducted by NAEVA indicated several distinct anomalies on the portion of the property east of Laurel Run and south of Zeitler Road. Field observations indicate that the Firehole is not one discrete area but rather a series of burn pits located across the property in an approximate 32-acre area.

The Firehole was reportedly the subject of a cleanup that saw the removal of tens of tons of contaminated soil. According to two separate sources, cousins Patrick and Richard Herron, soil was removed from an area where crops would not grow, and clean soil was brought in to fill the excavation. The removed soil was said to have contained scraps of brass shell casing and metallic slag. Recyclable metal was recovered and sold to a scrap dealer; soil was removed to an unknown location.

5.0 PREVIOUS STUDIES

In April 2001, MDE performed a Site Survey of the Elkton Farm site to determine whether further action was necessary. The survey recommended further action in order to

document potential hazards associated with a release of site contaminants to the ground and surface waters of the State of Maryland.

In July 2002, MDE contracted Environmental Science and Technology (ENSAT) to provide for a geophysical assessment of an area of the Elkton Farm to document the location of the Firehole. NAEVA was contracted to perform the analysis. ENSAT transmitted the NAEVA final report (Appendix C) to MDE on September 3, 2002. This report identified areas that are likely to be locations of the Firehole. All anomalies were delineated and tagged to a global positioning sensor (GPS) grid.

MDE personnel conducted an Expanded Site Investigation (ESI) sampling of the site in the Fall of 2002 and Spring of 2003. Sampling began on October 8, 2002 with the collection of soil, sediment and surface water and concluded on May 21, 2003 with the collection of groundwater. All samples were analyzed for Target Analyte List (TAL) inorganics, Target Compound List (TCL) organics, and nitroaromatic compounds. The results of this sampling are documented in the MDE Report, *Formerly Used Defense Site Inspection Of The Elkton Farm Firehole Site (MD-433)*.

6.0 MDE Contract Laboratory Program (CLP) Sampling

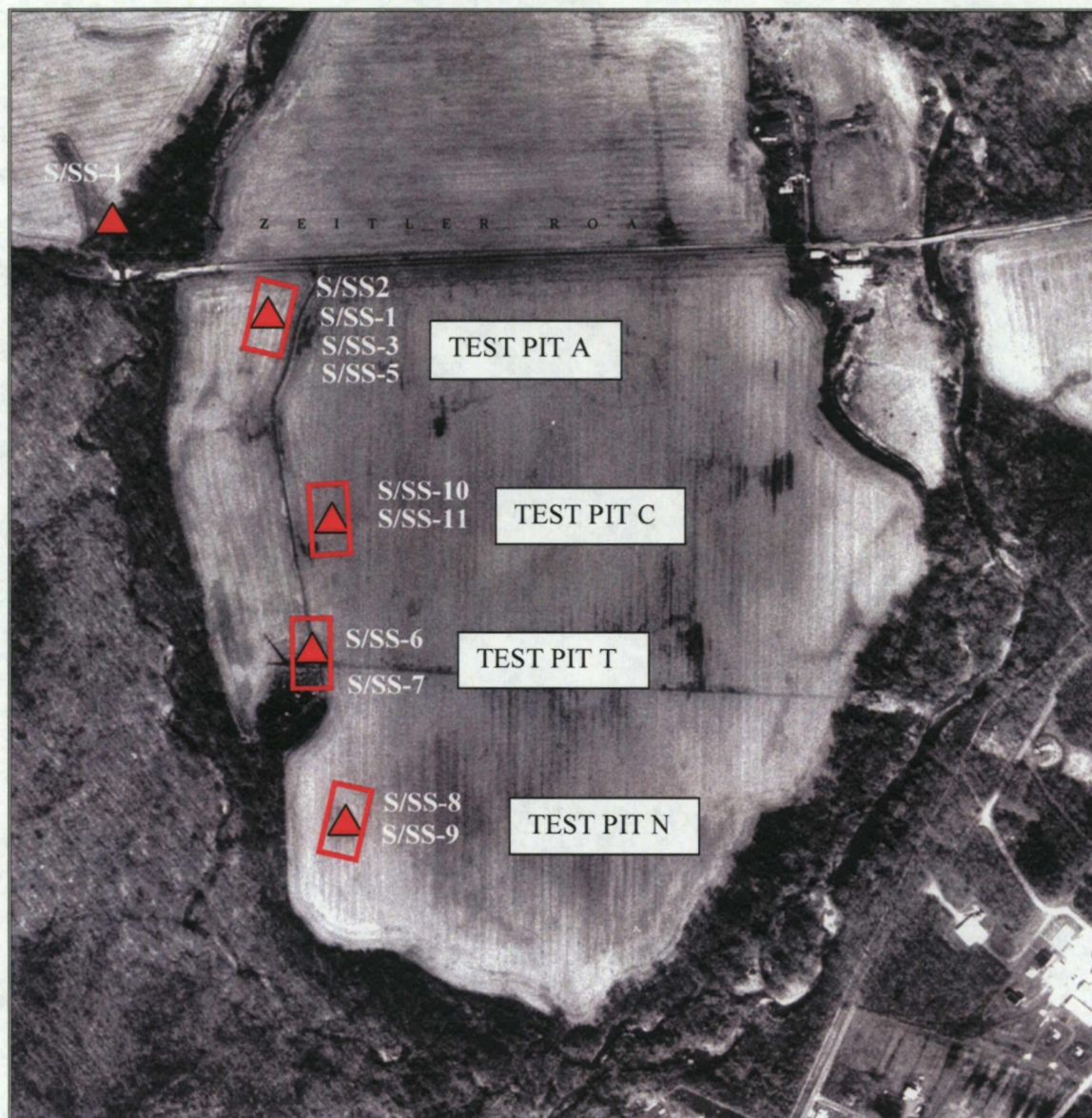
MDE proposed a further investigation of the Elkton Farm Firehole site in its Preremedial Cooperative Agreement with EPA in Fiscal Year 2004. Accordingly, a sampling plan proposal was submitted to the EPA Region III office in June 2004 for the proposed collection of additional surface and subsurface soil at the site. The purpose of the sampling was to evaluate areas within suspected Firehole areas for munitions-related contamination. EPA gave verbal approval to the sampling proposal in July 2004.

MDE personnel conducted the sampling according to procedures outlined in EPA's CLP Routine Analytical Services as Case Number 33696/DAS R32050. Sampling began on December 14, 2004 and concluded on January 12, 2004. All samples were analyzed for TAL inorganics, TCL organics, perchlorates and nitroaromatic compounds (Appendix D). MDE collected the samples in three matrices: one organic solid, one inorganic solid and one DAS solid. Sampling procedures are fully outlined in MDE's Standard Operating Procedures. Each matrix included the collection of a field duplicate sample and a matrix spike sample. MDE prepared trip blanks consisting of deionized water in 40 ml vials preserved with hydrochloric acid. The trip blank was shipped and analyzed along with samples for volatile organic compounds. The sampling locations are shown on Figure 5 and the sampling summary table is shown in Table 3.

Table 3 - Sample Summary Table

Sample Identification	Sample Type	Sample Location	Rationale
S/SS-1	Soil	Test Pit A – at firehole located just south of Zeitler Road and West of the access road	Characterize waste source Matrix Spike Sample
S/SS-2	Soil	Test Pit A – at firehole located just south of Zeitler Road and West of the access road	Characterize waste source
S/SS-3	Soil	Test Pit A – at firehole located just south of Zeitler Road and West of the access road	Characterize waste source
S/SS-5	Soil	Test Pit A – at firehole located just south of Zeitler Road and West of the access road	Characterize waste source
S/SS-4	Soil	Woods NW of Site Across Laurel Run	Area background
S/SS-6	Soil	Test Pit T – at the TMRA west of the access road	Characterize waste source
S/SS-7	Soil	Test Pit T – at the TMRA west of the access road.	Characterize waste source
S/SS-8	Soil	Test Pit N – no grow zone between power line and access road	Characterize waste source
S/SS-9	Soil	Test Pit N – no grow zone between power line and access road	Characterize waste source
S/SS-10	Soil	Test Pit C – no grow zone East of access road	Characterize waste source
S/SS-11	Soil	Test Pit C – no grow zone East of access road	Characterize waste Source
S/SS-12	Soil	Duplicate of S/SS-5	Duplicate sample of S/SS-5

Figure 5 – Sample Location Map



6.1 Groundwater Sampling Results

No groundwater was collected for this phase of the investigation.

6.2 Surface Water Sampling Results

Surface water was not collected for this phase of the Elkton Farm Firehole investigation.

6.3 Sediment Sampling Results

Sediment was not collected for this phase of the Elkton Farm Firehole investigation.

6.4 Soil Sampling Results

MDE collected twelve surface soil samples (including one duplicate) and twelve subsurface soil samples (including one duplicate) for a total of twenty-four soil samples from four areas designated as potential Fireholes by the NAEVA geophysical study. Contaminants detected were screened against MDE Cleanup Standards for Residential Soils and EPA Region III Risk Based Concentrations (RBCs) for Residential Soils. VOC analysis was performed on subsurface samples only. Due to the proximity of the Firehole to the surface, 14 to 18 inches below ground surface, a composite of the top 18 inches of soil was collected for full analysis at locations S1, S2, and S3. Soil samples SS1, SS2 and SS3 were collected at a depth of 14 to 18 inches and analyzed for VOCs only. All other soil samples were analyzed for TAL metals, perchlorates and nitroaromatic compounds.

The metals barium, cadmium, calcium, chromium, copper, lead, manganese, mercury, silver, sodium, thallium, and zinc exceeded 3X background in the surface soil data documented in the inorganic data package. Most of the exceedances, and the highest concentrations, were in samples S1, S2, S3, S5 and S12, which were collected directly in the Firehole. Concentrations of aluminum, arsenic, barium, cadmium, copper, iron, lead, manganese, mercury, thallium and zinc exceeded screening levels in multiple samples. Trichloroethene was detected in SS1, SS3, SS5, and SS12, and benzene was detected in SS2. Concentrations detected for these VOCs did not exceed the screening levels. Nitroaromatic compounds were detected in five of the nine sample locations for this phase of the study. The four samples that did not contain nitroaromatic compounds included the background sample, S4X, and samples S8X and S9X, which were collected in test pit N in the far south of the Firehole field, and sample S11X which was collected in test pit C east of the gravel access road. All sites west of the gravel access road contained levels of nitroaromatic compounds. 2,4,6- TNT varied from a low detection of 0.017 mg/kg at S2X to a site high of 1300 mg/kg at S7X. Two samples, S7X and S12X, contained TNT at levels above the EPA risk-based concentration for residential soils of 21 mg/kg. MDE does not have a clean-up level for nitroaromatic compounds.

In the subsurface soil samples, aluminum, antimony, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, cyanide, iron, lead, manganese, nickel, potassium, sodium, vanadium and zinc exceeded 3X background. Concentrations of arsenic, cadmium, iron, and manganese exceeded either one or both of the screening levels for inorganics. 2,4,6-TNT, 4-amino 2,6-

Dinitrotoluene and 2-amino 4,6-Dinitrotoluene were detected in SS5X, SS6X, SS7X, and SS12X but only one concentration exceeded any screening benchmark. 2,4,6-TNT was detected in SS7X at 30.5 mg/kg exceeding the EPA RBC of 21 mg/kg.

Table 4 - Inorganic Data for Surface Soils

Analyte mg/kg	S4 Bgrd	S1	S2	S3	S5 DUP S12	S6	S7	S8	S9	S10	S11	S12 Dup S5	EPA ¹ RBC	MDE ² Cleanup Std.
ALUMINUM	12000	10700	16500	12900	11800	12100	13100	11800	17800	19800	18600	9540	78,000	7,800
ANTIMONY	ND	ND	ND	ND	2.9 J	ND	ND	ND	ND	ND	ND	2.4 J	31	12
ARSENIC	3.7 J	5.5	9.5	4.5	4.4 J	3 J	3.5 J	3.4 J	5 J	4.4 J	4.7 J	3.3 J	0.43	2
BARIUM	80.9 J	611 J	1960 J	570 J	717 J	97.2 J	576 J	26.4 J	52.9 J	709 J	992 J	377 J	5,500	550
BERYLLIUM	0.81	0.46 J	0.65 J	0.8	0.51 J	0.76	0.79	0.34 J	0.59 J	0.6 J	0.57 J	0.42 J	160	16
CADMIUM	ND	5.7	13.6	6.5	5 J	ND	2.4 J	ND	ND	0.36 J	0.27 J	2.8 J	39	3.9
CALCIUM	922	1130	5010	2630	3690	536 J	1360	492 J	880	2040	1700	3290	--	--
TOTAL CHROMIUM	17.4 J	50.8 L	289 L	30.6 L	155 J	15 J	18.7 J	21.6 J	28.4 J	29.1 J	29 J	73.9 J	230 (Cr+6)	23 (Cr+6)
COBALT	7.1	5.3 J	14.3 J	7.1 J	4.9 J	6.3	5.7 J	2.7 J	4.1 J	5.5 J	5.6 J	4.5 J	1,600	160
COPPER	9.2 L	407 J	+10200 J	319 J	137 L	6.2 L	59.6 L	7.8 L	11.4 L	120 L	60.2 L	223 L	3,100	310
IRON	13900 J	20200	57200	16000	20000 J	12000 J	13300 J	18300 J	24600 J	24400 J	24600 J	19700 J	23,000	2,300
LEAD	13.4 J	726 J	852 J	295 J	459 J	10.3 J	105 J	5.9 J	11.2 J	136 J	122 J	541 J	--	400
MAGNESIUM	1440	1420	2440	1780	3220	1660	2320	1230	1620	3050	2430	2690	--	--
MANGANESE	479 J	730 J	1260 J	742 J	453 J	208 J	337 J	50.4 J	121 J	182 J	167 J	381 J	1,600	160
MERCURY	0.028 J	0.22 K	0.41 K	0.098 J	0.19	0.013 J	0.077 J	0.034 J	0.06 J	0.12 J	0.029 J	0.12 J	--	0.1
NICKEL	9.7 J	13.4 J	30.2 J	12.6 J	18.2 J	8.8 J	10.8 J	6.1 J	9.4 J	14 J	12.8 J	13.3 J	1,600	160
POTASSIUM	408 J	504 J	1040	574 J	581 J	332 J	446 J	429 J	583 J	869	729	514 J	--	--
SELENIUM	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.38 J	390	39
SILVER	0.13 J	0.43 J	2.2	0.45 J	0.44 J	ND	0.069 J	0.072 J	J	0.24 J	0.2 J	0.26 J	390	39
SODIUM	ND	ND	195 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	--	--
THALLIUM	ND	4.5	15.6	3.2	ND	ND	ND	ND	ND	ND	ND	ND	5.5	2
VANADIUM	23.4	27.2	30.9	23.8	29.5	20.6	21.5	29.2	39.5	41.6	37.8	24.2	550	55
ZINC	33.2	568	+4560	736	657	30.2	1536	20.2	32.1	144	110	552	23,000	2,300
CYANIDE	ND	0.21 J	0.95 J	0.42 J	0.73 J	ND	2.1 J	ND	ND	ND	ND	0.85 J	1600	160

Qualifiers: J = analyte present, reported value may not be accurate or precise; L = Analyte present, reported value may be biased low, actual value is expected to be higher; K = analyte present, reported value may be biased high, actual value is expected to be lower; + = results reported from dilution analysis [] = analyte present, as values approach the instrument detection limit the quantitation may not be accurate. Green box indicates levels that exceed 3X background; Yellow highlight indicates levels that exceed MDE cleanup standards; Blue highlight indicates levels that exceed 3X background and MDE cleanup standards; Red highlight indicates levels that exceed both MDE cleanup standards and RBCs. Gray highlight indicates levels that exceed 3X background, MDE cleanup standards and RBCs.

1 - EPA Region III Risk Based Concentrations for Residential Soils.

2 - MDE Cleanup Standards for Residential Soils.

Table 5 - Inorganic Data for Subsurface Soils

Analyte mg/kg	SS4 Bgrd	SS5 DUP SS12	SS6	SS7	SS8	SS9	SS10	SS11	SS12 Dup SS5	EPA RBC ¹	MDE Cleanup Std ²
ALUMINUM	3850	16300	4400	17800	989	1050	17100	15100	32000	78,000	7,800
ANTIMONY	ND	17.1 L	ND	ND	ND	ND	ND	ND	12.6 L	31	12
ARSENIC	0.98 J	22.4 J	1.2 J	4.3 J	0.36 J	0.85 J	3.7 J	4 J	16.4 J	0.43	2
BARIUM	12.7 J	2780 J+	11.3 J	53.1 J	3.3 J	3.2 J	52 J	53 J	1970 J	5,500	550
BERYLLIUM	0.18 J	1.5	0.27 J	0.66	ND	0.14 J	0.73	0.59 J	0.79	160	16
CADMIUM	ND	64.6 J	ND	ND	ND	ND	ND	ND	49.3 J	39	3.9
CALCIUM	289 J	11500	168 J	544 J	6539	ND	747	616 J	7640	--	--
TOTAL CHROMIUM	12.7 J	206 J	12.1 J	24.8 J	11.3 J	14.6 J	23.7 J	25.1 J	170 J	230 (Cr+6)	230 (Cr+6)
COBALT	1.5 J	8.3	1.8 J	5 J	2 J	1.5 J	7.1	4.8 J	12.1	1,600	160
COPPER	3.7 L	2810 L	5.4 L	12.6 L	3.3 L	3.9 L	13.3 L	11.9 L	871 L	3,100	310
IRON	6170 J	73400 J+	9520 J	21700 J	5170 J	7850 J	21900 J	23400 J	80800 J+	23,000	2,300
LEAD	3.8 J	2860 J	2.8 J	8.7 J	1.3 J	1.3 J	8 J	7.9 J	2620 J	--	400
MAGNESIUM	573 J	5270	523 J	3050	90.4 J	107 J	3190	2460	3920	--	--
MANGANESE	40.4 J	1720 J	54.4 J	132 J	65.9 J	54.4 J	166 J	107 J	1740 J	1,600	160
MERCURY	ND	0.25	ND	ND	0.031 J	0.1 J	0.021 J	ND	0.33	--	0.1
NICKEL	3 J	41.9 J	3 J	12.7 J	1.1 J	1.1 J	13.1 J	10.8 J	60.8 J	1,600	160
POTASSIUM	135 J	763	172 J	831	30.9 J	34.3 J	1000	789	634 J	--	--
SELENIUM	ND	2.6 J	ND	ND	ND	ND	ND	ND	2.2 J	390	39
SILVER	ND	3.3	ND	ND	ND	ND	ND	ND	3	390	39
SODIUM	ND	261 J	ND	ND	ND	ND	ND	ND	159 J	--	--
THALLIUM	ND	1.7 J	ND	ND	ND	ND	ND	ND	1.3 J	5.5	2
VANADIUM	10.8	28.5	14.6	41.2	6.9	10.6	41	39	26.9	78	55
ZINC	10	4280+	19.9	36.1	ND	ND	34.2	27.6	4050 +	23,000	2,300
CYANIDE	ND	3.8	ND	ND	ND	ND	ND	ND	0.73 J	1600	160

Qualifiers: J = analyte present, reported value may not be accurate or precise; B = not detected substantially above the level reported in laboratory or field blanks; [] = analyte present, as values approach the instrument detection limit the quantitation may not be accurate; L=Analyte present, reported value may be biased low, actual value is expected to be higher; K = analyte present, reported value may be biased high, actual value is expected to be lower. + = results reported from dilution analysis

Green box indicates levels that exceed 3X background; Yellow highlight indicates levels that exceed MDE cleanup standards; Blue highlight indicates levels that exceed 3X background and MDE cleanup standards; Red highlight indicates levels that exceed both MDE cleanup standards and RBCs. . Gray highlight indicates levels that exceed 3X background and RBCs

1 - EPA Region III Risk Based Concentrations for Residential Soils.

2 - MDE Cleanup Standards for Residential Soils.

Table 6 – VOC Data for Subsurface Soil Samples

Analyte µg/kg	SS4 Bkgrnd	SS1	SS2	SS3	SS5	SS6	SS7	SS8	SS9	SS10	SS11	SS12 Dup of SS5	EPA RBC ¹	MDE Cleanup Std. ²
ACETONE	2J	ND	ND	ND	ND	4J	4J	4J	3J	ND	ND	ND	7.0E+07	7.8E+05
CIS-1,2-DICHLOROETHENE	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3J	7.8E+05	7.8E+04
BENZENE	ND	ND	ND	7J	ND	ND	ND	ND	ND	ND	ND	ND	1.2E+04	1.2E+04
TRICHLOROETHENE	ND	37	ND	17	62	ND	ND	ND	ND	ND	ND	140	1600	5.8E+04

Qualifiers: J = analyte present, reported value may not be accurate or precise; B = not detected substantially above the level reported in laboratory or field blanks.

1 – EPA Region III Risk Based Concentrations for Residential Soils.

2 – MDE Cleanup Standards for Residential Soils

Table 7 – Nitroaromatic Compound Results for Surface Soil Samples

Analyte mg/kg	S4X BG	S1X	S2X	S3X	S5X	S6X	S7X	S8X	S9X	S10X	S11X	S12X	EPA RBC ¹	MDE Cleanup Stnd. ²
4-AMINO 2,6-DINITROTOLUENE	ND	0.065	0.062	0.108	0.961	0.233	9 J	ND	ND	ND	ND	0.731	160	--
2-AMINO 4,6-DINITROTOLUENE	ND	0.042	0.045	0.105	1.12	0.438	16 J	ND	ND	ND	ND	0.714	160	--
1,3-DINITROBENZENE	ND	ND	ND	ND	ND	ND	0.919	ND	ND	ND	ND	ND	7.8	--
DINITROTOLUENE MIX	ND	0.105	ND	ND	ND	ND	5.4 J	ND	ND	ND	ND	0.0545	0.94	--
1,3,5-TRINITROBENZENE	ND	ND	ND	ND	0.152	ND	48 J	ND	ND	ND	ND	0.121	2,300	--
2,4,6-TRINITROTOLUENE	ND	0.046	0.017 J	0.345	2.92	0.0593	1300	0.0730	ND	ND	ND	192	21	--

Red highlight indicates levels that exceed RBCs

1 – EPA Region III Risk Based Concentrations for Residential Soils.

2 – MDE Cleanup Standards for Residential Soils.

Table 8 – Nitroaromatic Compound Results for Subsurface Soil Samples

Analyte mg/kg	SS4X	SS5X	SS6X	SS7X	SS8X	SS9X	SS10X	SS11X	SS12X	EPA RBC ¹	MDE Cleanup Stnd. ²
4-AMINO 2,6-DINITROTOLUENE	ND	7.08	ND	0.38	ND	ND	ND	ND	4.86	160	--
2-AMINO 4,6-DINITROTOLUENE	ND	8.04	0.0547	0.846	ND	ND	ND	ND	6.35	160	--
1,3-DINITROBENZENE	ND	0.03 J	ND	ND	ND	ND	ND	ND	ND	7.8	--
DINITROTOLUENE MIX	ND	0.219	ND	0.144	ND	ND	ND	ND	0.173	0.94	--
1,3,5-TRINITROBENZENE	ND	0.296	0.02	1.2 J	ND	ND	ND	ND	0.203	2,300	--
2,4,6-TRINITROTOLUENE	ND	10.1	0.358	30.5	ND	ND	0.0483	ND	3.84	21	--

Red highlight indicates levels that exceed RBCs

1 – EPA Region III Risk Based Concentrations for Residential Soils.

2 – MDE Cleanup Standards for Residential Soils.

7.0 FINDINGS AND CONCLUSIONS

A toxicological evaluation was prepared for the Firehole site, assuming a residential future use scenario for the site (Appendix B). Risk estimates exceeded EPA and MDE recommended levels for the child resident population for incidental ingestion of surface soils, with the risk drivers of arsenic, copper, iron, thallium and 2,4,6-TNT. Risk estimates exceeded EPA and MDE recommended levels for the child resident population for dermal contact with surface and subsurface soils, with the risk drivers of chromium and vanadium. Concentrations detected exceeded the EPA and MDE recommended levels for ingestion of surface soil for the youth resident, adult resident, and construction worker with the risk drivers of 2,4,6-TNT. Lead was detected in SS5 at 2860 mg/kg, which may pose a threat to sensitive populations and the environment.

All samples were collected in areas identified by MDE's geophysical survey, (Appendix C) as the most likely Firehole areas. Sample analysis showed elevated concentrations of lead, mercury, and arsenic as well as TCE, 2,4,6-TNT and associated daughter products in two of four anomaly areas on the Firehole site; labeled Test Pit A and Test Pit T on the sample plan map. Test Pit A is near the intersection of Fisher Lane, the gravel access road, and Zeitler Road. Test Pit T is at the TMRA. Both areas show as anomalies in the geophysical report and in the historical air photos, circa 1947. The highest levels of nitroaromatic compounds were detected in the TMRA area. This may be the result of TEI disposal activity, or it may be from the Thiokol operation at the TMRA, or a combination of both.

In addition to operating the remote geoprobe for Firehole soil sample collection, UXB's ordnance expert identified various ordnance-related components and debris. Components identified from ordnance specification diagrams included 20-mm detonators, 40-mm explosive shells, float light charges, and miscellaneous other components of military ordnance.

The Elkton Farm property is for sale. It is currently leased to an area farmer for crop rotation; however, in all likelihood, the entire farm will be developed for residential use in the future, rather than continued use for farming. The presence of TNT and daughter products, elevated concentrations of metals, and TCE detected in site soils and the presence of ordnance-related debris easily observable on the ground surface all suggest that action is necessary in order to mitigate human health risks to future residential populations.

8.0 REFERENCES

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17. U.S. Department of the Interior Geological Survey, *Characteristics of Streamflow in Maryland, Report of Investigations No. 35*, 1983.

Appendix A – Photographs



Fisher Lane from TMRA



TMRA Sample Location



TMRA Staging Area



View South towards Test Pit N



TMRA Sample Area



TNT Test Kit



Soil Sampling



Setting Remote Geoprobe on S/SS3

Appendix B - Toxicological Evaluation.

Appendix C – Geophysical Survey

Appendix D – Geophysical Logs

Appendix E – Laboratory Data

11/12/05

DATE

MDE-ERRP BORING LOG AND SAMPLE DATA

SITE CODE

SAMPLE LOCATION 5-9

SURFACE CONDITIONS: _____

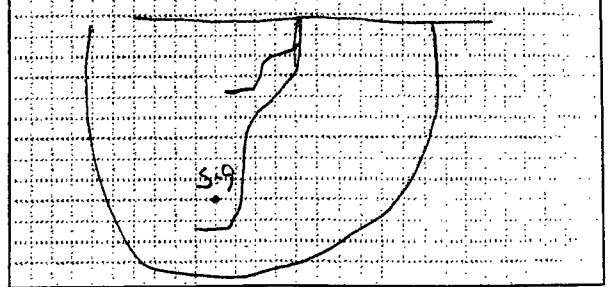
WEATHER: _____

PCA CODE: _____

PROJECT NAME: ELKTON FIREHOLE

OBSERVER/GEOLOGIST: _____

LOCATION:



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DRILLER _____ START DATE: ____/____/____ END DATE: ____/____/____

1 / 11 / 05

DATE

MDE-ERRP BORING LOG AND SAMPLE DATA

SITE CODE

SAMPLE LOCATION S-7

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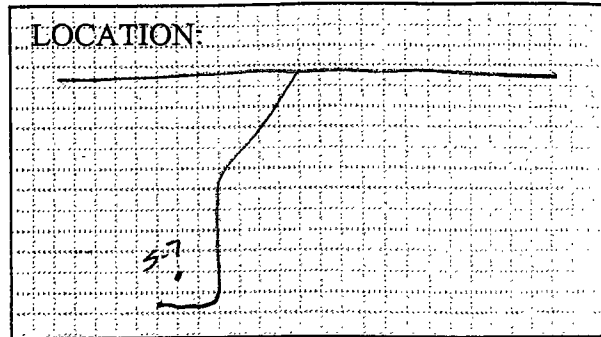
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PCA CODE: _____

PROJECT NAME: ELKTON FIREHOLE

OBSERVER/GEOLOGIST: _____

LOCATION:



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2		✓		
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3		↓		
		POSSIBLE GREN LAYER	<input type="checkbox"/> GRAVEL <input type="checkbox"/> SAND <input type="checkbox"/> SILT <input type="checkbox"/> CLAY	[S] [W]
4		(BLACK MATERIAL)		
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RILLER

START DATE: ___ / ___ / ___ END DATE: ___ / ___ / ___

1/11/05
DATE

MDE-ERRP BORING LOG AND SAMPLE DATA

SITE CODE

SAMPLE LOCATION S-6

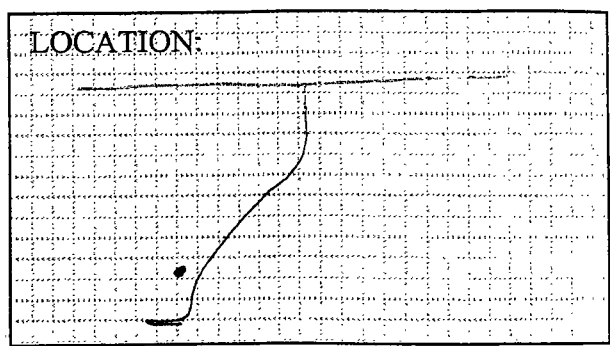
SURFACE CONDITIONS: _____

WEATHER: _____

PCA CODE: _____

PROJECT NAME: ELKTON FIREHOUSE

OBSERVER/GEOLOGIST: _____



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DRILLER _____ START DATE: ____/____/____ END DATE: ____/____/____

1 / 11 / 05

DATE

MDE-ERRP BORING LOG AND SAMPLE DATA

SITE CODE

SAMPLE LOCATION S-11 85' SOUTH OF S-10

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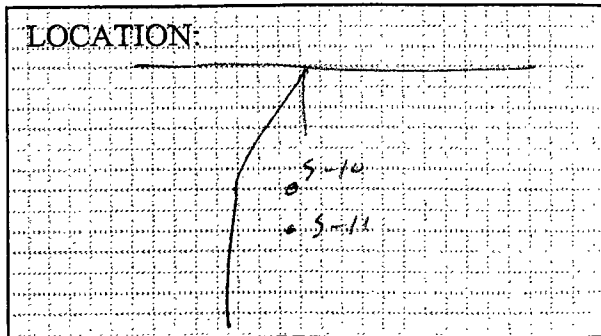
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PCA CODE: _____

PROJECT NAME: FLATON FIREHOLE

OBSERVER/GEOLOGIST: _____

LOCATION:



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		↓		
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		↓		
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DRILLER _____ START DATE: ____ / ____ / ____ END DATE: ____ / ____ / ____

1/11/05

DATE

MDE-ERRP BORING LOG AND SAMPLE DATA

SITE CODE

SAMPLE LOCATION S-10

SURFACE CONDITIONS: _____

WEATHER: _____

PCA CODE: _____

PROJECT NAME: ELKTON FIRE HOLE

OBSERVER/GEOLOGIST: _____

LOCATION:

S-10

		<input type="checkbox"/> GRAVEL	<input type="checkbox"/> SAND	<input type="checkbox"/> SILT	<input type="checkbox"/> CLAY	[S] [W]
1	MR					
	DARK BROWN SILT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
2	↓					
	ORANGE SILT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
3	↓					
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
4	↓					
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
5	ORANGE SANDS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
6	ORANGE SANDS BUTTOM BROWN WET SILT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
7	ORANGE SANDS					
	ORANGE SAND w/ GRAVEL	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
8	TAN SAND					
	RED-ORANGE SILT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
9	SAPROLITE					
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	[S] [W]

DRILLER _____ START DATE: ____/____/____ END DATE: ____/____/____

DATE _____

SITE CODE

SURFACE CONDITIONS: *MOIST*

WEATHER: _____

PCA CODE: _____

PROJECT NAME: _____

OBSERVER/GEOLOGIST: _____

LOCATION

LOCATION:

[illegible]

DRILLER START DATE: / / END DATE: / /

DATE _____

SITE CODE

SAMPLE LOCATION: S-4

SURFACE CONDITIONS: _____

WEATHER: _____

PCA CODE: _____

PROJECT NAME: ELIXTON FIRE NO. 4

OBSERVER/GEOLOGIST: _____

LOCATION: 5.0

DRILLER START DATE: ___/___/___ END DATE: ___/___/___

DATE _____

SITE CODE

OBSERVER/GEOLOGIST: _____

LOCATION

LOCATION:

[illegible]

DRILLER _____ START DATE: ___/___/___ END DATE: ___/___/___

**Maryland Department of the Environment
Waste Management Administration
Environmental Restoration and Redevelopment Program**

MEMORANDUM

TO: Alex Cox, Project Manager
Brownfields/Site Assessment Division

THROUGH: Patti Davis, Project Manager
Brownfields/Site Assessment Division

FROM: Mark A. Mank, Toxicologist
Environmental Restoration and Redevelopment Program

SUBJECT: Toxicological Data Screen – Elkton Farm Firehole, Operable Unit 2 (OU2),
Elkton, Cecil County, Maryland

DATE: April 26, 2005

The toxicological data screen for the Elkton Farm Firehole, OU2 site is attached. For the purposes of this evaluation a residential use scenario was assumed for estimating risk to potentially exposed populations. Soil samples were analyzed for VOCs, metals, explosives and perchlorate. No groundwater samples were collected on site.

The estimated risks from the incidental ingestion of detected noncarcinogenic surface soil contaminants exceeded MDE and EPA recommended risk levels for all residential populations utilizing both the maximum detected concentrations and the 95% UCL concentrations as the site-wide average concentrations. Risk estimates for the incidental ingestion of detected carcinogenic surface soil contaminants exceeded MDE recommended risk levels for the child resident, youth resident and adult resident residential populations utilizing the maximum detected concentration as the site-wide average concentrations. Carcinogenic risk estimates for the incidental ingestion of detected surface soil contaminants were within MDE recommended risk ranges for the construction worker residential population and EPA recommended risk ranges for all residential populations utilizing the maximum detected concentration as the site-wide average concentrations. Carcinogenic risk estimates for the incidental ingestion of detected surface soil contaminants exceeded MDE recommended risk ranges for child and adult resident populations utilizing the 95% UCL concentrations as the site-wide average concentrations. Carcinogenic risk estimates for the incidental ingestion of detected surface soil contaminants were within MDE recommended risk ranges for the youth resident and construction worker residential populations and EPA recommended risk ranges for all residential populations utilizing the 95% UCL concentrations as the site-wide average concentrations.

95% UCL concentrations were not calculated for the subsurface soil data set due to insufficient sampling size. The estimated risks from the incidental ingestion of detected noncarcinogenic subsurface soil contaminants exceeded MDE and EPA recommended risk levels for the child resident, youth resident and construction worker residential populations utilizing the maximum detected concentration as the site-wide average concentration. The estimated risks from the incidental ingestion of detected noncarcinogenic subsurface soil contaminants were below MDE and EPA recommended risk thresholds for the adult resident population utilizing the maximum detected concentration as the site-wide average concentration. The estimated risks from the incidental ingestion of detected carcinogenic subsurface soil contaminants exceeded MDE recommended risk ranges for the child, youth, and adult residential populations utilizing the maximum detected concentration as the site-wide average concentration. The estimated risks from the incidental ingestion of detected carcinogenic subsurface soil contaminants were within MDE recommended risk ranges for the construction worker residential population and EPA recommended risk ranges for all residential populations utilizing the maximum detected concentrations as the site-wide average concentrations.

The estimated noncarcinogenic and carcinogenic risks from the inhalation of detected and nondetected volatiles and fugitive dust from surface and subsurface soils were within acceptable levels as recommended by MDE and EPA for all residential populations utilizing the 95% UCL concentrations and maximum detected concentrations as the site-wide average concentrations.

Risk estimates for dermal exposure to detected noncarcinogenic surface soil contaminants exceeded MDE and EPA recommended risk levels for the child resident population utilizing both the maximum detected concentrations and the 95% UCL concentrations as the site-wide average concentrations. Risk estimates for dermal exposure to detected noncarcinogenic surface soil contaminants were below MDE and EPA recommended risk levels for the youth resident, adult resident and construction worker residential populations. Risk estimates for dermal exposure to detected carcinogenic surface soil contaminants were within MDE and EPA recommended risk ranges for all residential populations utilizing the maximum detected concentrations and 95% UCL concentrations as the site-wide average concentrations. Risk estimates for dermal exposure to detected noncarcinogenic subsurface soil contaminants exceeded MDE and EPA recommended risk levels for the child resident population utilizing the maximum detected concentrations as the site-wide average concentrations. Risk estimates for dermal exposure to detected carcinogenic subsurface soil contaminants were within MDE and EPA recommended risk ranges for all residential populations utilizing the maximum detected concentrations as the site-wide average concentrations.

The maximum concentration of lead detected in soils on site exceeded the 400 mg/kg residential soil screening value. The maximum detected surface and subsurface soil concentrations on site were 852 and 2860 mg/kg, respectively. The mean surface and subsurface soil lead concentrations on site were 297 and 689 mg/kg, respectively. Based on the available data the concentrations of lead in soils on site may pose a threat to the health of sensitive populations and the environment.

Vapor intrusion from mercury contamination in soil exceeded a hazard index (HI) of 1 for residential populations, however, the anticipated typical concentration (ATC) for mercury in this region of the State was greater than the maximum detected concentration on site. Based upon this fact the potential for mercury vapor intrusion to indoor air was not considered further on site. One detected contaminant (benzene) in subsurface soil exceeded a HI of 1 and two detected subsurface soil contaminants (benzene and trichloroethene) exceeded a cancer risk of greater than 1×10^{-5} for residential populations from vapor intrusion to indoor air.

Twelve detected surface and subsurface soil contaminants exceeded their recommended MDE residential soil cleanup standard. Multiple explosive related contaminants detected on site have no soil MDE cleanup standards.

Refer to the attached toxicological evaluation for details regarding specific risk drivers for each exposure pathway.

Please contact me (x3436) if you have any questions.

/MAM

attachment

Elkton Farm Firehole OU2, Elkton, Maryland Toxicological Evaluation

Summary

This toxicological evaluation examines the human health risks associated with the Elkton Farm Firehole, Operable Unit 2 (OU2) property, located in Elkton, Cecil County, Maryland. This site was evaluated for child resident (1-6 years), youth resident (6-17), adult resident and construction worker populations under a residential future use scenario. This toxicological evaluation evaluates risks to residential use populations only. The United States Environmental Protection Agency (EPA) has recommended default exposure parameters that were used to estimate cumulative risk from all chemicals (1, 2, and 3). EPA recognizes as an acceptable Hazard Index (HI) values less than or equal to 1 (noncarcinogenic chemicals) and excess lifetime cancer risk (CR) less than or equal to 10^{-6} to 10^{-4} . The Maryland Department of the Environment (MDE) recognizes as an acceptable HI values less than or equal to 1 and excess lifetime cancer risk less than or equal to 10^{-6} to 10^{-5} . Based on these exposures, estimated risks at the site were compared to MDE and EPA recommended levels, and the following conclusions were reached:

Summary table of Hazard Indices (HI) values and Cancer Risk (CR) values for residential populations using maximum detected concentrations

Noncarcinogenic Endpoints Detected Contaminants Only			
Population	Pathway	Hazard Index	Risk Drivers
Child resident	Ingestion-surface soil	48	Copper, iron, thallium 2,4,6-TNT
Youth resident	Ingestion-surface soil	9	2,4,6-TNT
Adult resident	Ingestion-surface soil	5	2,4,6-TNT
Construction worker	Ingestion-surface soil	18	2,4,6-TNT
Child resident	Ingestion-subsurface soil	12	Iron
Youth resident	Ingestion-subsurface soil	2	Potential additive effects
Construction worker	Ingestion-subsurface soil	5	Potential additive effects
Child resident	Dermal contact-surface soil	11	Chromium, vanadium
Child resident	Dermal contact-subsurface soil	11	Cadmium, chromium, vanadium
Carcinogenic Endpoints Detected Contaminants Only			
Population	Pathway	Cancer Risk	Risk Drivers
Child resident	Ingestion-surface soil	5.8×10^{-5}	Arsenic, 2,4,6-TNT
Youth resident	Ingestion-surface soil	2.2×10^{-5}	2,4,6-TNT
Adult resident	Ingestion-surface soil	3.1×10^{-5}	2,4,6-TNT
Child resident	Ingestion-subsurface soil	3.8×10^{-5}	Arsenic
Youth resident	Ingestion-subsurface soil	1.4×10^{-5}	Arsenic
Adult resident	Ingestion-subsurface soil	2.0×10^{-5}	Arsenic
Youth resident	Dermal contact-subsurface soil	1.3×10^{-5}	Arsenic
Adult resident	Dermal contact-subsurface soil	2.5×10^{-5}	Arsenic

**Summary table of Hazard Indices (HI) values and Cancer Risk (CR) values
for residential populations utilizing 95% UCL concentrations (surface soil only)**

Noncarcinogenic Endpoints Detected Contaminants Only			
Population	Pathway	Hazard Index	Risk Drivers
Child resident	Ingestion-surface soil	15	2,4,6-TNT
Youth resident	Ingestion-surface soil	3	2,4,6-TNT
Adult resident	Ingestion-surface soil	2	2,4,6-TNT
Construction worker	Ingestion-surface soil	6	2,4,6-TNT
Child resident	Dermal Contact-surface soil	6	Chromium
Carcinogenic Endpoints Detected Contaminants Only			
Population	Pathway	Cancer Risk	Risk Drivers
Child resident	Ingestion-surface soil	2.1×10^{-5}	2,4,6-TNT
Adult resident	Ingestion-surface soil	1.1×10^{-5}	Potential additive effects

Site Description

The Elkton Farm Firehole site is located at 183 Zeitler Road, Elkton, Maryland. The farm site consists of approximately 328 acres and is situated in a rural setting just north of the Triumph Industrial Park. The firehole portion of the property is a 100-acre parcel located on the USGS Bayview/Newark West quadrangles. OU2 is a 1-acre parcel located within the firehole portion of the site. The firehole was defined as an area for the disposal of waste explosive material. TEI collected waste explosive material from their manufacture of explosive ordinance and placed it in drums. This accumulated waste was kept wetted with alcohol or ether to prevent spontaneous ignition and carried to a shallow pit off Zeitler Road, spread thinly and allowed to burn. During the early 1940's, TEI owned Elkton Farm. The Herron family, the current owners, acquired the property in 1948. In the late 1950s and early 1960s, the Thiokol Corporation leased a one-acre plot of the farm property to combust and clean rocket motors. The structures remaining from this test area are located on the west side of the property. Throughout most of its history, the Elkton farm site has been used as a livestock farm with much of the surrounding fields under cultivation. However, during the period between the end of World War II and the 1970s, hazardous material was stored and/or disposed of on the farm. In the early 1980s, the owner of the farm attempted to dispose of 53 drums of hazardous waste but was refused and consequently stored them in two farm buildings until he reported them to MDE almost ten years ago. An additional area of concern is centered on a one-acre parcel of the farm along Laurel Run approximately 1400 feet south of Zeitler Road. During a period in the late 1950's to mid 1960's, Thiokol Corporation leased this property and constructed several small buildings, undefined underground structures and a network of steel gantries. Thiokol Corporation used the facility to combust residual fuel and clean rocket motors for reuse. The depth to groundwater is estimated to be 20 feet. Surface water drains from the site to Laurel Run, located approximately 500 feet from the site. According to the MDE Well Completion Database, there are multiple drinking water wells within a ½ mile radius of the site.

1.0 Method

In evaluating risk to human health, maximum concentrations of all chemicals detected in soil were compared to medium-specific screening levels (EPA Region III Risk Based Concentration values and Maryland Department of the Environment Cleanup Standards). Chemicals that exceeded human health Risk Based Concentration (RBC) values were then evaluated quantitatively. Relevant toxicological data and RBC values from surrogate compounds (structurally similar analogues) were used for some of the chemicals with no corresponding RBC value. Soil samples were collected from locations on the site. Groundwater was collected during previous investigations of the site. This investigation focused on OU2 and potential contaminants associated with the soil.

1.1 Human Health

Maximum concentrations of all chemicals detected in soils (dry weight values) were compared to the EPA Region III Risk Based Concentrations (RBC) for residential soil (4). Comparison of dry weight analytical values to the RBCs is recognized as a conservative

measure but provides consistency in risk assessments across sites (with variable soil moisture content) and sampling time. Prior to comparison with each chemical concentration, noncarcinogenic RBCs were multiplied by 0.1, in order to account for any additivity of systemic effects. Carcinogenic RBC values were not adjusted and represent a target risk level of 10^{-6} . Carcinogenic and noncarcinogenic risk levels for all contaminants that exceeded their respective RBC screening level were evaluated quantitatively. The quantitative evaluation was based on expected future use and development scenarios and includes populations typically expected to frequent the site based on this proposed future use.

The future land use at the site was assumed to be residential; therefore, the residential exposure scenario was used to evaluate risk at the site. The contaminants identified at the site at concentrations that exceeded residential RBCs were further evaluated with regard to risk to relevant populations under the following scenarios (1, 2, 3, and 7):

Residential Development:

Adult Resident: 30-year exposure duration, 70 kg body weight, 5700 cm² skin surface area (soil), 350 days per year exposure for soil ingestion, 100 mg soil ingested per day, 24 hours inhalation, 0.07 mg/cm²-event soil to skin adherence factor, 0.833 m³/hour inhalation rate, 70-year lifetime.

Construction Worker: 70 kg body weight, 3280 cm² skin surface area (soil), 0.08mg/cm²-event soil to skin adherence factor, 250 days per year exposure for soil ingestion, 480 mg soil ingested per day, 1.5 m³/hour inhalation rate, 8 hour exposure time (inhalation soil), 1 year exposure duration, 70 year lifetime.

Youth (6 - 17 years) Resident: 40 kg body weight, 4320 cm² skin surface area (soil), 0.07mg/cm²-event soil to skin adherence factor, 350 days per year soil ingestion, 100 mg soil ingested per day, 0.56 m³/hour inhalation rate, 24 hours inhalation exposure, 12 year exposure duration, 70 year lifetime.

Child (1 - 6 years) Resident: 15 kg body weight, 2350 cm² skin surface area (soil), 0.5mg/cm²-event soil to skin adherence factor, 350 days per year soil ingestion, 200 mg soil ingested per day, 0.32 m³/hour inhalation rate, 24 hour inhalation exposure, 6 year exposure duration, 70 year lifetime.

2.0 Human Health Evaluation

Soil samples were analyzed for VOCs, metals, explosives and perchlorate. Chemicals that were detected on site were compared to medium-specific screening levels (EPA Region III RBC values). Chemicals that were not detected at the site and exceeded RBC values (at an assumed concentration of one half the detection level) were carried through the quantitative risk assessment and were included in the summation of noncarcinogenic hazard quotients and carcinogenic cancer risk values for comparative purposes only. Chemicals detected at the site that exceeded human health RBC values were evaluated quantitatively using the

maximum detected concentration as the site-wide average concentration. 95% upper confidence level (95 % UCL) concentrations were calculated for those chemicals identified as risk drivers in the quantitative evaluation and an additional quantitative evaluation performed utilizing the 95% UCL concentration as the site-wide average concentrations. 95% UCL concentrations were only calculated for the surface soil sampling data set. 95% UCL concentrations were not calculated for the subsurface soil data set due to insufficient sampling size.

No RBC values were available for the dinitrotoluene isomers (2,4- & 2,6-) and perchlorate. Perchlorate was not detected at the site but limited toxicological data was available for this compound. The lack of toxicological data adds a degree of uncertainty to the risk analysis. Magnesium, calcium, potassium, iron and sodium are essential nutrients that may be present on site and are toxic only at very high concentrations. These compounds are found naturally in the soil of this geographic region; therefore, they were included in the quantitative risk estimates for comparative purposes only.

The EPA has issued a directive for lead that recommends a soil screening level of 400 mg/kg for residential scenarios at RCRA facilities and CERCLA sites; the 400-mg/kg soil screening level was used in this evaluation for soil (5).

2.1 Soil

Soil samples were analyzed for VOCs, metals, explosives and perchlorate. Contaminants that were detected above their respective residential soil RBCs (i.e. failed the initial screening process, see Attachment A) were evaluated quantitatively. Surface and subsurface soil exposures were evaluated via the ingestion, inhalation, dermal contact and vapor intrusion of volatiles to indoor air pathways. Reference dose (RfD) and cancer slope factor (CSF) values were obtained from EPA Region III and IRIS (4, 6). Estimates of noncarcinogenic and carcinogenic risks from dermal contact were calculated when sufficient data (permeability constants (8), oral absorption efficiencies and dermal absorption factors (9)) were available.

2.2 Groundwater

Groundwater samples were not collected in OU2.

2.3 Vapor Intrusion

All volatile and semivolatile contaminants detected in soil samples at the site were quantitatively evaluated for vapor intrusion using the Johnson and Ettinger Tier I vapor intrusion model (10).

2.4 MDE Cleanup Standards Screen

All soil samples collected on site were compared to the MDE *State of Maryland Department of the Environment Cleanup Standards for Soil and Groundwater Interim Final Guidance*, August 2001 (11).

3.0 Conclusion

3.1 Soil

The estimated risks from the incidental ingestion of detected noncarcinogenic surface soil contaminants exceeded MDE and EPA recommended risk levels for all residential populations (Tables 1 and 1UCL) utilizing both the maximum detected concentrations and the 95% UCL concentrations as the site-wide average concentrations. Copper, iron, thallium and 2,4,6-trinitrotoluene (2,4,6-TNT) were the noncarcinogenic risk drivers using the maximum detected concentrations as the site-wide average concentrations and 2,4,6-TNT was the noncarcinogenic risk driver using the 95% UCL concentrations as the site-wide average concentrations. Iron is a naturally occurring element whose concentrations on site were considered to result from naturally occurring parent rocks. Risk estimates for the incidental ingestion of detected carcinogenic surface soil contaminants exceeded MDE recommended risk levels for the child resident, youth resident and adult resident residential populations (Table 2) utilizing the maximum detected concentration as the site-wide average concentrations. Arsenic and 2,4,6-TNT were the carcinogenic risk drivers for the affected populations. Carcinogenic risk estimates for the incidental ingestion of detected surface soil contaminants were within MDE recommended risk ranges for the construction worker residential population and EPA recommended risk ranges for all residential populations utilizing the maximum detected concentration as the site-wide average concentrations. Carcinogenic risk estimates for the incidental ingestion of detected surface soil contaminants exceeded MDE recommended risk ranges for child and adult resident populations utilizing the 95% UCL concentrations as the site-wide average concentrations (Table 2UCL). 2,4,6-TNT was the carcinogenic risk driver for the affected populations. Carcinogenic risk estimates for the incidental ingestion of detected surface soil contaminants were within MDE recommended risk ranges for the youth resident and construction worker residential populations and EPA recommended risk ranges for all residential populations utilizing the 95% UCL concentrations as the site-wide average concentrations.

95% UCL concentrations were not calculated for the subsurface soil data set due to insufficient sampling size. The estimated risks from the incidental ingestion of detected noncarcinogenic subsurface soil contaminants exceeded MDE and EPA recommended risk levels for the child resident, youth resident and construction worker residential populations (Table 3) utilizing the maximum detected concentration as the site-wide average concentration. Iron was the noncarcinogenic risk driver for incidental ingestion of subsurface soil. As stated previously, iron is a naturally occurring element whose concentrations on site were considered to result from naturally occurring parent rocks. The estimated risks from the incidental ingestion of detected noncarcinogenic subsurface soil contaminants were below MDE and EPA recommended risk thresholds for the adult resident

population utilizing the maximum detected concentration as the site-wide average concentration. The estimated risks from the incidental ingestion of detected carcinogenic subsurface soil contaminants exceeded MDE recommended risk ranges for the child, youth, and adult residential populations (Table 4) utilizing the maximum detected concentration as the site-wide average concentration. Arsenic was the carcinogenic risk driver for incidental ingestion of subsurface soil. The estimated risks from the incidental ingestion of detected carcinogenic subsurface soil contaminants were within MDE recommended risk ranges for the construction worker residential population and EPA recommended risk ranges for all residential populations utilizing the maximum detected concentrations as the site-wide average concentrations.

The estimated noncarcinogenic and carcinogenic risks from the inhalation of detected and nondetected volatiles and fugitive dust from surface and subsurface soils were within acceptable levels as recommended by MDE and EPA for all residential populations (Tables 5 through 8) utilizing the 95% UCL concentrations and maximum detected concentrations as the site-wide average concentrations.

Risk estimates for dermal exposure to detected noncarcinogenic surface soil contaminants exceeded MDE and EPA recommended risk levels for the child resident population (Table 9 and 9UCL) utilizing both the maximum detected concentrations and the 95% UCL concentrations as the site-wide average concentrations. Chromium, conservatively evaluated as hexavalent chromium, and vanadium were the noncarcinogenic risk drivers using the maximum detected concentrations as the site-wide average concentrations and chromium was the noncarcinogenic risk driver using the 95% UCL concentrations as the site-wide average concentrations. Risk estimates for dermal exposure to detected noncarcinogenic surface soil contaminants were below MDE and EPA recommended risk levels for the youth resident, adult resident and construction worker residential populations. Risk estimates for dermal exposure to detected carcinogenic surface soil contaminants were within MDE and EPA recommended risk ranges for all residential populations (Table 10 and 10UCL) utilizing the maximum detected concentrations and 95% UCL concentrations as the site-wide average concentrations. Risk estimates for dermal exposure to detected noncarcinogenic subsurface soil contaminants exceeded MDE and EPA recommended risk levels for the child resident population (Table 11) utilizing the maximum detected concentrations as the site-wide average concentrations. Chromium, conservatively evaluated as hexavalent chromium, and vanadium were the noncarcinogenic risk drivers using the maximum detected concentrations as the site-wide average concentrations. Risk estimates for dermal exposure to detected carcinogenic subsurface soil contaminants were within MDE and EPA recommended risk ranges for all residential populations (Table 12) utilizing the maximum detected concentrations as the site-wide average concentrations.

The maximum concentration of lead detected in soils on site exceeded the 400 mg/kg residential soil screening value. The maximum detected surface and subsurface soil concentrations on site were 852 and 2860 mg/kg, respectively. The mean surface and subsurface soil lead concentrations on site were 297 and 689 mg/kg, respectively. Based on the available data the concentrations of lead in soils on site may pose a threat to the health of sensitive populations and the environment.

3.2 Groundwater

Groundwater samples were not collected in OU2.

3.3 Vapor Intrusion

The risk from surface and subsurface vapor intrusion of detected volatile and semivolatile contaminants in groundwater and soil into buildings was evaluated using the Johnson and Ettinger vapor intrusion model (Attachment B). Vapor intrusion from mercury contamination in soil exceeded a hazard index (HI) of 1 for residential populations, however, the anticipated typical concentration (ATC) for mercury in this region of the State was greater than the maximum detected concentration on site. Based upon this fact the potential for mercury vapor intrusion to indoor air was not considered further on site. One detected contaminant (benzene) in subsurface soil exceeded a HI of 1 and two detected subsurface soil contaminants (benzene and trichloroethene) exceeded a cancer risk of greater than 1×10^{-5} for residential populations from vapor intrusion to indoor air.

3.4 MDE Cleanup Standards Screen

The concentrations of all chemicals analyzed in soil were compared to their corresponding MDE residential cleanup standards (Attachment A). Twelve detected surface and subsurface soil contaminants exceeded their recommended MDE residential soil cleanup standard. Multiple explosive related contaminants detected on site have no soil MDE cleanup standards.

3.5 Evaluation Assumptions

When determining whether an increased risk to human health exists at this site, it is important to understand that this evaluation was prepared as a first level screening evaluation. Many conservative assumptions are included in this evaluation, which were developed with the understanding that if the estimated risk, using the conservative assumptions, does not exceed EPA's recommended levels, then the risk estimated using more realistic scenarios will not exceed these levels.

Since this evaluation includes many conservative assumptions, a risk that exceeds EPA's recommended level of risk does not necessarily indicate an increased risk to human health. When this situation occurs, it is necessary to consider several points when determining if the risk actually does represent a threat to human health. For example, the quantitative risk estimate in this evaluation assumes people will be exposed to a contaminant at the maximum concentration all throughout the site and for the entire exposure duration. These assumptions do not take into account whether the maximum concentration is anomalous or characteristic of the site, or that biodegradation, dispersion, dilution, or other factors may decrease the contaminant concentration throughout the time of exposure.

This evaluation also assumes that the bioavailability of each contaminant is 100 percent, and that all of the contaminant taken into the body is absorbed across the digestive tract into the body. A chemical is harmful to human health only if it is absorbed into the body. Assuming complete bioavailability does not consider the fact that it is common for a fraction of the chemical taken into the body to be excreted rather than absorbed into the body. The bioavailability of a contaminant is dependent on many factors, such as the state or form of the contaminant and if the actual size of the contaminant particle would permit incidental ingestion. These issues must be considered when evaluating the appropriateness of assuming total bioavailability of a contaminant.

4.0 References

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2. EPA. 1991. *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual Supplemental Guidance "Standard Default Exposure Factors" Interim Final*. Office of Emergency and Remedial Response. OSWER Directive: 9285.6-03.
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4. EPA, Region III. Risk-Based Concentration Table, April 14, 2004.
5. EPA. *Memorandum: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. Office of Solid Waste and Emergency Response. OSWER Directive # 9355.4-12.
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9. EPA. Region III, 1995. *Technical Guidance Manual, Risk Assessment, Assessing Dermal Exposure from Soil*. EPA/903-K-95-003.
10. EPA. *User's Guide for the Johnson and Ettinger (1991) Model for subsurface Vapor Intrusion into Buildings*. June, 2003.
11. Maryland Department of the Environment. *State of Maryland Department of the Environment Cleanup Standards for Soil and Groundwater*. Interim Final Guidance. August 2001.

TABLES

**Table 1. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Incidental Ingestion/Surface Soil
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
ALUMINUM	19800		1E+00	3E-02	3E-02	9E-02	9E-02	5E-02	5E-02	3E-01	3E-01
ANTIMONY	9.4	L	4E-04	1E-05	3E-02	4E-05	1E-01	2E-05	6E-02	1E-04	3E-01
ARSENIC	9.5		3E-04	1E-05	4E-02	4E-05	1E-01	2E-05	8E-02	1E-04	4E-01
BARIUM	1960	J	7E-02	3E-03	4E-02	9E-03	1E-01	5E-03	7E-02	3E-02	4E-01
CADMIUM	13.6		1E-03	2E-05	2E-02	6E-05	6E-02	3E-05	3E-02	2E-04	2E-01
CHROMIUM	289	L	3E-03	4E-04	1E-01	1E-03	5E-01	7E-04	2E-01	4E-03	1E+00
COPPER	10200	J+	4E-02	1E-02	3E-01	5E-02	1E+00	2E-02	6E-01	1E-01	3E+00 *
IRON	57200		3E-01	8E-02	3E-01	3E-01	9E-01	1E-01	5E-01	7E-01	2E+00 *
MANGANESE	1260	J	2E-02	2E-03	9E-02	6E-03	3E-01	3E-03	2E-01	2E-02	8E-01
THALLIUM	15.6		7E-05	2E-05	3E-01	7E-05	1E+00	4E-05	5E-01	2E-04	3E+00 *
VANADIUM	41.6		1E-03	6E-05	6E-02	2E-04	2E-01	1E-04	1E-01	5E-04	5E-01
ZINC	4560	+	3E-01	6E-03	2E-02	2E-02	7E-02	1E-02	4E-02	6E-02	2E-01
2,4,6-TRINITROTOLUENE	1300		5E-04	2E-03	4E+00 *	6E-03	1E+01 *	3E-03	6E+00 *	2E-02	3E+01 *
2-AMINO-4,6-DINITROTOLUENE	16	J	2E-04	2E-05	1E-01	8E-05	4E-01	4E-05	2E-01	2E-04	1E+00
4-AMINO-2,6-DINITROTOLUENE	9	J	2E-04	1E-05	6E-02	4E-05	2E-01	2E-05	1E-01	1E-04	6E-01
1,3-dinitrobenzene	12.5	U	1E-04	2E-05	2E-01	6E-05	6E-01	3E-05	3E-01	2E-04	2E+00 *
Hazard Index for Detected Compounds Only:				Sum =	5.1E+00 *	Sum =	1.8E+01 *	Sum =	8.9E+00 *	Sum =	4.8E+01 *
Hazard Index for Nondetected Compounds Only:				Sum =	1.7E-01	Sum =	5.9E-01	Sum =	3.0E-01	Sum =	1.6E+00 *
Hazard Index for Detected and Nondetected Compounds:				Sum =	5.3E+00 *	Sum =	1.8E+01 *	Sum =	9.2E+00 *	Sum =	4.9E+01 *

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

Table 10. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Incidental Ingestion/Surface Soil
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
ALUMINUM	15963	UCL	1E+00	2E-02	2E-02	7E-02	7E-02	4E-02	4E-02	2E-01	2E-01
ANTIMONY	5.2	UCL	4E-04	7E-06	2E-02	2E-05	6E-02	1E-05	3E-02	7E-05	2E-01
ARSENIC	5.7	UCL	3E-04	8E-06	3E-02	3E-05	9E-02	1E-05	5E-02	7E-05	2E-01
BARIUM	1960	MAX	7E-02	3E-03	4E-02	9E-03	1E-01	5E-03	7E-02	3E-02	4E-01
CHROMIUM	147.8	UCL	3E-03	2E-04	7E-02	7E-04	2E-01	4E-04	1E-01	2E-03	6E-01
COPPER	2332	UCL	4E-02	3E-03	8E-02	1E-02	3E-01	6E-03	1E-01	3E-02	7E-01
IRON	29650	UCL	3E-01	4E-02	1E-01	1E-01	5E-01	7E-02	2E-01	4E-01	1E+00
MANGANESE	618.6	UCL	2E-02	8E-04	4E-02	3E-03	1E-01	1E-03	7E-02	8E-03	4E-01
THALLIUM	5.4	UCL	7E-05	7E-06	1E-01	3E-05	4E-01	1E-05	2E-01	7E-05	1E+00
VANADIUM	33.6	UCL	1E-03	5E-05	5E-02	2E-04	2E-01	8E-05	8E-02	4E-04	4E-01
ZINC	4560	MAX	3E-01	6E-03	2E-02	2E-02	7E-02	1E-02	4E-02	6E-02	2E-01
2,4,6-TRINITROTOLUENE	349.3	UCL	5E-04	5E-04	1E+00	2E-03	3E+00 *	8E-04	2E+00 *	4E-03	9E+00 *
2-AMINO-4,6-DINITROTOLUENE	4.3	UCL	2E-04	6E-06	3E-02	2E-05	1E-01	1E-05	5E-02	5E-05	3E-01
4-AMINO-2,6-DINITROTOLUENE	2.5	UCL	2E-04	3E-06	2E-02	1E-05	6E-02	6E-06	3E-02	3E-05	2E-01
1,3-dinitrobenzene	12.5	U	1E-04	2E-05	2E-01	6E-05	6E-01	3E-05	3E-01	2E-04	2E+00 *
Hazard Index for Detected Compounds Only:				Sum =	1.6E+00 *	Sum =	5.5E+00 *	Sum =	2.8E+00 *	Sum =	1.5E+01 *
Hazard Index for Nondetected Compounds Only:				Sum =	1.7E-01	Sum =	5.9E-01	Sum =	3.0E-01	Sum =	1.6E+00 *
Hazard Index for Detected and Nondetected Compounds:				Sum =	1.8E+00 *	Sum =	6.1E+00 *	Sum =	3.1E+00 *	Sum =	1.7E+01 *

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

**Table 2. Quantitative Risk Assessment - Carcinogenic
Residential Use - Incidental Ingestion/Surface soil.
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				LADD	CR	LADD	CR	LADD	CR	LADD	CR
ARSENIC	9.5		2E+00	6E-06	8E-06	6E-07	1E-06	4E-06	6E-06	1E-05	2E-05
2,4,6-TRINITROTOLUENE	1300		3E-02	8E-04	2E-05	9E-05	3E-06	5E-04	2E-05	1E-03	4E-05
Cancer Risk for Detected Compounds Only:				Sum =	3.1E-05	Sum =	3.6E-06	Sum =	2.2E-05	Sum =	5.8E-05
Cancer Risk for Detected and Nondetected Compounds:				Sum =	3.1E-05	Sum =	3.6E-06	Sum =	2.2E-05	Sum =	5.8E-05

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

Table 2UCL. Quantitative Risk Assessment - Carcinogenic

Residential Use - Incidental Ingestion/Surface soil.

For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				LADD	CR	LADD	CR	LADD	CR	LADD	CR
ARSENIC	5.7	UCL	2E+00	3E-06	5E-06	4E-07	6E-07	2E-06	4E-06	6E-06	9E-06
2,4,6-TRINITROTOLUENE	349.3	UCL	3E-02	2E-04	6E-06	2E-05	7E-07	1E-04	4E-06	4E-04	1E-05
Cancer Risk for Detected Compounds Only:				Sum =	1.1E-05	Sum =	1.3E-06	Sum =	7.8E-06	Sum =	2.1E-05
Cancer Risk for Detected and Nondetected Compounds:				Sum =	1.1E-05	Sum =	1.3E-06	Sum =	7.8E-06	Sum =	2.1E-05

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

**Table 3. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Incidental Ingestion/Subsurface Soil
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
ALUMINUM	32000		1E+00	4E-02	4E-02	2E-01	2E-01	8E-02	8E-02	4E-01	4E-01
ANTIMONY	17.1	L	4E-04	2E-05	6E-02	8E-05	2E-01	4E-05	1E-01	2E-04	5E-01
ARSENIC	22.4	J	3E-04	3E-05	1E-01	1E-04	4E-01	5E-05	2E-01	3E-04	1E+00
BARIUM	2780	J+	7E-02	4E-03	5E-02	1E-02	2E-01	7E-03	1E-01	4E-02	5E-01
CADMIUM	64.6	J	1E-03	9E-05	9E-02	3E-04	3E-01	2E-04	2E-01	8E-04	8E-01
CHROMIUM	206	J	3E-03	3E-04	9E-02	1E-03	3E-01	5E-04	2E-01	3E-03	9E-01
COPPER	2810	L	4E-02	4E-03	1E-01	1E-02	3E-01	7E-03	2E-01	4E-02	9E-01
IRON	80800	J+	3E-01	1E-01	4E-01	4E-01	1E+00	2E-01	6E-01	1E+00	3E+00 *
MANGANESE	1740	J	2E-02	2E-03	1E-01	8E-03	4E-01	4E-03	2E-01	2E-02	1E+00
THALLIUM	1.7	J	7E-05	2E-06	3E-02	8E-06	1E-01	4E-06	6E-02	2E-05	3E-01
VANADIUM	41.2		1E-03	6E-05	6E-02	2E-04	2E-01	1E-04	1E-01	5E-04	5E-01
ZINC	4280	+	3E-01	6E-03	2E-02	2E-02	7E-02	1E-02	3E-02	5E-02	2E-01
2,4,6-TRINITROTOLUENE	30.5		5E-04	4E-05	8E-02	1E-04	3E-01	7E-05	1E-01	4E-04	8E-01
2-AMINO-4,6-DINITROTOLUENE	8.04		2E-04	1E-05	6E-02	4E-05	2E-01	2E-05	1E-01	1E-04	5E-01
4-AMINO-2,6-DINITROTOLUENE	7.08		2E-04	1E-05	5E-02	3E-05	2E-01	2E-05	8E-02	9E-05	5E-01
1,3-dinitrobenzene	2.5	U	1E-04	3E-06	3E-02	1E-05	1E-01	6E-06	6E-02	3E-05	3E-01
Hazard Index for Detected Compounds Only:				Sum =	1.3E+00	Sum =	4.5E+00 *	Sum =	2.3E+00 *	Sum =	1.2E+01 *
Hazard Index for Nondetected Compounds Only:				Sum =	3.4E-02	Sum =	1.2E-01	Sum =	6.0E-02	Sum =	3.2E-01
Hazard Index for Detected and Nondetected Compounds:				Sum =	1.4E+00	Sum =	4.7E+00 *	Sum =	2.4E+00 *	Sum =	1.3E+01 *

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

**Table 4: Quantitative Risk Assessment - Carcinogenic
Residential Use - Incidental Ingestion/Subsurface soil.
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				LADD	CR	LADD	CR	LADD	CR	LADD	CR
ARSENIC	22.4	J	2E+00	1E-05	2E-05	2E-06	2E-06	9E-06	1E-05	2E-05	4E-05
2,4,6-TRINITROTOLUENE	30.5		3E-02	2E-05	5E-07	2E-06	6E-08	1E-05	4E-07	3E-05	1E-06
Cancer Risk for Detected Compounds Only:				Sum =	2.0E-05	Sum =	2.3E-06	Sum =	1.4E-05	Sum =	3.8E-05
Cancer Risk for Detected and Nondetected Compounds:				Sum =	2.0E-05	Sum =	2.3E-06	Sum =	1.4E-05	Sum =	3.8E-05

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

Table 5. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Inhalation of Volatiles and Fugitive Dust (Surface Soil).
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	PEF/VF	Adult Resident		Construction Worker		Youth Resident		Child Resident	
					ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
Particulate Emission:				PEF								
ALUMINUM	19800		1E-03	9.63E+08	6E-06	6E-03	2E-06	2E-03	7E-06	7E-03	1E-05	1E-02
BARIUM	1960	J	1E-04	9.63E+08	6E-07	4E-03	2E-07	2E-03	7E-07	5E-03	1E-06	7E-03
CADMIUM	13.6		6E-05	9.63E+08	4E-09	7E-05	2E-09	3E-05	5E-09	8E-05	7E-09	1E-04
CHROMIUM	289	L	3E-05	9.63E+08	8E-08	3E-03	4E-08	1E-03	1E-07	3E-03	1E-07	5E-03
MANGANESE	1260	J	1E-05	9.63E+08	4E-07	3E-02	2E-07	1E-02	4E-07	3E-02	6E-07	4E-02
MERCURY	0.41	K	9E-05	9.63E+08	1E-10	1E-06	5E-11	6E-07	1E-10	2E-06	2E-10	2E-06
Volatilization:				VF								
ALUMINUM	19800		1E-03									
BARIUM	1960	J	1E-04									
CADMIUM	13.6		6E-05									
CHROMIUM	289	L	3E-05									
MANGANESE	1260	J	1E-05									
MERCURY	0.41	K	9E-05	3.20E+04	4E-06	4E-02	2E-06	2E-02	4E-06	5E-02	6E-06	7E-02
	Particle Hazard Index for Detected Compounds Only:				Sum =	3.7E-02	Sum =	1.6E-02	Sum =	4.4E-02	Sum =	6.7E-02
	Volatile Hazard Index for Detected Compounds Only:				Sum =	4.1E-02	Sum =	1.7E-02	Sum =	4.8E-02	Sum =	7.3E-02
	Hazard Index via Inhalation (Detected and nondetected compounds):				Sum =	7.8E-02	Sum =	3.4E-02	Sum =	9.2E-02	Sum =	1.4E-01

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

Table SECL. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Inhalation of Volatiles and Fugitive Dust (Surface Soil).
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	PEF/VF	Adult Resident		Construction Worker		Youth Resident		Child Resident	
					ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
Particulate Emission:				PEF								
ALUMINUM	15963	UCL	1E-03	9.63E+08	5E-06	5E-03	2E-06	2E-03	5E-06	5E-03	8E-06	8E-03
BARIUM	1960	MAX	1E-04	9.63E+08	6E-07	4E-03	2E-07	2E-03	7E-07	5E-03	1E-06	7E-03
CHROMIUM	147.8	UCL	3E-05	9.63E+08	4E-08	1E-03	2E-08	6E-04	5E-08	2E-03	8E-08	3E-03
MANGANESE	618.6	UCL	1E-05	9.63E+08	2E-07	1E-02	8E-08	5E-03	2E-07	1E-02	3E-07	2E-02
MERCURY	0.41	K	9E-05	9.63E+08	1E-10	1E-06	5E-11	6E-07	1E-10	2E-06	2E-10	2E-06
Volatilization:				VF								
ALUMINUM	15963	UCL	1E-03									
BARIUM	1960	MAX	1E-04									
CHROMIUM	147.8	UCL	3E-05									
MANGANESE	618.6	UCL	1E-05									
MERCURY	0.41	K	9E-05	3.20E+04	4E-06	4E-02	2E-06	2E-02	4E-06	5E-02	6E-06	7E-02
	Particle Hazard Index for Detected Compounds Only:				Sum =	2.2E-02	Sum =	9.5E-03	Sum =	2.6E-02	Sum =	4.0E-02
	Volatile Hazard Index for Detected Compounds Only:				Sum =	4.1E-02	Sum =	1.7E-02	Sum =	4.8E-02	Sum =	7.3E-02
	Hazard Index via Inhalation (Detected and nondetected compounds):				Sum =	6.3E-02	Sum =	2.7E-02	Sum =	7.4E-02	Sum =	1.1E-01

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

Table 6. Quantitative Risk Assessment - Carcinogenic
Residential Use - Inhalation of Volatiles and Fugitive Dust (Surface Soil).
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	PEF/VF	Adult Resident		Construction Worker		Youth Resident		Child Resident	
					LADD	CR	LADD	CR	LADD	CR	LADD	CR
Particulate Emission:				PEF								
ARSENIC	9.5	L	2E+01	9.63E+08	1E-09	2E-08	2E-11	2E-10	5E-10	8E-09	4E-10	6E-09
CADMIUM	13.6		6E+00	9.63E+08	2E-09	1E-08	2E-11	1E-10	8E-10	5E-09	6E-10	4E-09
CHROMIUM	289		4E+01	9.63E+08	4E-08	1E-06	5E-10	2E-08	2E-08	7E-07	1E-08	5E-07
Volatilization:				VF								
ARSENIC	9.5	L	2E+01									
CADMIUM	13.6		6E+00									
CHROMIUM	289		4E+01									
	Particle Cancer Risk Totals for Detected Compounds Only:				Sum =	1.5E-06	Sum =	2.1E-08	Sum =	6.9E-07	Sum =	5.3E-07
	Volatile Cancer Risk Totals for Detected Compounds Only:				Sum =	--	Sum =	--	Sum =	--	Sum =	--
	Total Cancer Risk via Inhalation (Detected and nondetected compounds):				Sum =	1.5E-06	Sum =	2.1E-08	Sum =	6.9E-07	Sum =	5.3E-07

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

Table 6UCL. Quantitative Risk Assessment - Carcinogenic
Residential Use - Inhalation of Volatiles and Fugitive Dust (Surface Soil).
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	PEF/VF	Adult Resident		Construction Worker		Youth Resident		Child Resident	
					LADD	CR	LADD	CR	LADD	CR	LADD	CR
Particulate Emission:					PEF							
ARSENIC	5.7	UCL	2E+01	9.63E+08	7E-10	1E-08	1E-11	1E-10	3E-10	5E-09	2E-10	4E-09
CHROMIUM	147.8	UCL	4E+01	9.63E+08	2E-08	7E-07	3E-10	1E-08	8E-09	3E-07	6E-09	3E-07
Volatilization:					VF							
ARSENIC	5.7	UCL	2E+01									
CHROMIUM	147.8	UCL	4E+01									
	Particle Cancer Risk Totals for Detected Compounds Only:				Sum =	7.5E-07	Sum =	1.1E-08	Sum =	3.5E-07	Sum =	2.7E-07
	Volatile Cancer Risk Totals for Detected Compounds Only:				Sum =	--	Sum =	--	Sum =	--	Sum =	--
	Total Cancer Risk via Inhalation (Detected and nondetected compounds):				Sum =	7.5E-07	Sum =	1.1E-08	Sum =	3.5E-07	Sum =	2.7E-07

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

Table 7. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Inhalation of Volatiles and Fugitive Dust (Subsurface Soil).
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	PEF/VF	Adult Resident		Construction Worker		Youth Resident		Child Resident	
					ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
Particulate Emission:				PEF								
ALUMINUM	32000		1E-03	9.63E+08	9E-06	9E-03	4E-06	4E-03	1E-05	1E-02	2E-05	2E-02
BARIUM	2780	J+	1E-04	9.63E+08	8E-07	6E-03	3E-07	2E-03	9E-07	7E-03	1E-06	1E-02
CADMIUM	64.6	J	6E-05	9.63E+08	2E-08	3E-04	8E-09	1E-04	2E-08	4E-04	3E-08	6E-04
CHROMIUM	206	J	3E-05	9.63E+08	6E-08	2E-03	3E-08	8E-04	7E-08	2E-03	1E-07	4E-03
MANGANESE	1740	J	1E-05	9.63E+08	5E-07	3E-02	2E-07	1E-02	6E-07	4E-02	9E-07	6E-02
MERCURY	0.33		9E-05	9.63E+08	9E-11	1E-06	4E-11	5E-07	1E-10	1E-06	2E-10	2E-06
Volatilization:				VF								
ALUMINUM	32000		1E-03									
BARIUM	2780	J+	1E-04									
CADMIUM	64.6	J	6E-05									
CHROMIUM	206	J	3E-05									
MANGANESE	1740	J	1E-05									
MERCURY	0.33		9E-05	3.20E+04	3E-06	3E-02	1E-06	1E-02	3E-06	4E-02	5E-06	6E-02
	Particle Hazard Index for Detected Compounds Only:				Sum =	5.2E-02	Sum =	2.2E-02	Sum =	6.1E-02	Sum =	9.3E-02
	Volatile Hazard Index for Detected Compounds Only:				Sum =	3.3E-02	Sum =	1.4E-02	Sum =	3.9E-02	Sum =	5.9E-02
	Hazard Index via Inhalation (Detected and nondetected compounds):				Sum =	8.4E-02	Sum =	3.6E-02	Sum =	9.9E-02	Sum =	1.5E-01

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

Table 8. Quantitative Risk Assessment - Carcinogenic
Residential Use - Inhalation of Volatiles and Fugitive Dust (Subsurface Soil).
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	PEF/VF	Adult Resident		Construction Worker		Youth Resident		Child Resident	
					LADD	CR	LADD	CR	LADD	CR	LADD	CR
Particulate Emission:					PEF							
ARSENIC	22.4	J	2E+01	9.63E+08	3E-09	4E-08	4E-11	6E-10	1E-09	2E-08	1E-09	1E-08
CADMIUM	64.6	J	6E+00	9.63E+08	8E-09	5E-08	1E-10	7E-10	4E-09	2E-08	3E-09	2E-08
CHROMIUM	206	J	4E+01	9.63E+08	3E-08	1E-06	4E-10	1E-08	1E-08	5E-07	9E-09	4E-07
Volatilization:					VF							
ARSENIC	22.4	J	2E+01									
CADMIUM	64.6	J	6E+00									
CHROMIUM	206	J	4E+01									
	Particle Cancer Risk Totals for Detected Compounds Only:				Sum =	1.1E-06	Sum =	1.6E-08	Sum =	5.3E-07	Sum =	4.0E-07
	Volatile Cancer Risk Totals for Detected Compounds Only:				Sum =	--	Sum =	--	Sum =	--	Sum =	--
	Total Cancer Risk via Inhalation (Detected and nondetected compounds):				Sum =	1.1E-06	Sum =	1.6E-08	Sum =	5.3E-07	Sum =	4.0E-07

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

**Table 9. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Dermal Contact/Surface Soil
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
ALUMINUM	19800		3E-01	1E-03	4E-03	5E-04	2E-03	1E-03	5E-03	1E-02	6E-02
ANTIMONY	9.4	L	4E-05	5E-07	1E-02	2E-07	6E-03	7E-07	2E-02	7E-06	2E-01
ARSENIC	9.5		3E-04	2E-06	5E-03	7E-07	2E-03	2E-06	7E-03	2E-05	7E-02
BARIUM	1960	J	7E-02	1E-04	2E-03	5E-05	7E-04	1E-04	2E-03	1E-03	2E-02
CADMIUM	13.6		3E-05	7E-07	3E-02	3E-07	1E-02	1E-06	4E-02	1E-05	4E-01
CHROMIUM	289	L	3E-05	2E-05	5E-01	7E-06	2E-01	2E-05	7E-01	2E-04	7E+00 *
COPPER	10200	J+	4E-02	6E-04	1E-02	3E-04	7E-03	7E-04	2E-02	8E-03	2E-01
IRON	57200		6E-02	3E-03	5E-02	1E-03	2E-02	4E-03	7E-02	4E-02	7E-01
MANGANESE	1260	J	1E-03	7E-05	6E-02	3E-05	3E-02	9E-05	8E-02	9E-04	8E-01
THALLIUM	15.6		7E-05	9E-07	1E-02	4E-07	6E-03	1E-06	2E-02	1E-05	2E-01
VANADIUM	41.6		2E-05	2E-06	1E-01	1E-06	5E-02	3E-06	2E-01	3E-05	2E+00 *
ZINC	4560	+	7E-02	2E-04	3E-03	1E-04	2E-03	3E-04	4E-03	3E-03	5E-02
2,4,6-TRINITROTOLUENE	1300										
2-AMINO-4,6-DINITROTOLUENE	16	J									
4-AMINO-2,6-DINITROTOLUENE	9	J									
1,3-dinitrobenzene	12.5	U									
Hazard Index for Detected Compounds Only:				Sum =	8.3E-01	Sum =	3.9E-01	Sum =	1.1E+00	Sum =	1.1E+01 *
Hazard Index for Nondetected Compounds Only:				Sum =	—	Sum =	—	Sum =	—	Sum =	—
Hazard Index for Detected and Nondetected Compounds:				Sum =	8.3E-01	Sum =	3.9E-01	Sum =	1.1E+00	Sum =	1.1E+01 *

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

Table 9 UCL. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Dermal Contact/Surface Soil
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
ALUMINUM	15963	UCL	3E-01	9E-04	3E-03	4E-04	2E-03	1E-03	4E-03	1E-02	4E-02
ANTIMONY	5.2	UCL	4E-05	3E-07	7E-03	1E-07	3E-03	4E-07	9E-03	4E-06	1E-01
ARSENIC	5.7	UCL	3E-04	9E-07	3E-03	4E-07	1E-03	1E-06	4E-03	1E-05	4E-02
BARIUM	1960	MAX	7E-02	1E-04	2E-03	5E-05	7E-04	1E-04	2E-03	1E-03	2E-02
CHROMIUM	147.8	UCL	3E-05	8E-06	3E-01	4E-06	1E-01	1E-05	4E-01	1E-04	4E+00 *
COPPER	2332	UCL	4E-02	1E-04	3E-03	6E-05	1E-03	2E-04	4E-03	2E-03	4E-02
IRON	29650	UCL	6E-02	2E-03	3E-02	8E-04	1E-02	2E-03	4E-02	2E-02	4E-01
MANGANESE	618.6	UCL	1E-03	3E-05	3E-02	2E-05	1E-02	4E-05	4E-02	5E-04	4E-01
THALLIUM	5.4	UCL	7E-05	3E-07	4E-03	1E-07	2E-03	4E-07	6E-03	4E-06	6E-02
VANADIUM	33.6	UCL	2E-05	2E-06	9E-02	9E-07	4E-02	2E-06	1E-01	3E-05	1E+00
ZINC	4560	MAX	7E-02	2E-04	3E-03	1E-04	2E-03	3E-04	4E-03	3E-03	5E-02
2,4,6-TRINITROTOLUENE	349.3	UCL									
2-AMINO-4,6-DINITROTOLUENE	4.3	UCL									
4-AMINO-2,6-DINITROTOLUENE	2.5	UCL									
1,3-dinitrobenzene	12.5	U									

Hazard Index for Detected Compounds Only:	Sum = 4.4E-01	Sum = 2.1E-01	Sum = 5.9E-01	Sum = 6.1E+00 *
Hazard Index for Nondetected Compounds Only:	Sum = --	Sum = --	Sum = --	Sum = --
Hazard Index for Detected and Nondetected Compounds:	Sum = 4.4E-01	Sum = 2.1E-01	Sum = 5.9E-01	Sum = 6.1E+00 *

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

**Table 10. Quantitative Risk Assessment - Carcinogenic
Residential Use - Dermal Contact/Surface soil.
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton; Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				LADD	CR	LADD	CR	LADD	CR	LADD	CR
ARSENIC	9.5		2E+00	7E-07	1E-06	1E-08	2E-08	4E-07	5E-07	2E-06	3E-06
2,4,6-TRINITROTOLUENE	1300										
Cancer Risk for Detected Compounds Only:				Sum =	1.0E-06	Sum =	1.6E-08	Sum =	5.3E-07	Sum =	2.8E-06
Cancer Risk for Detected and Nondetected Compounds:				Sum =	1.0E-06	Sum =	1.6E-08	Sum =	5.3E-07	Sum =	2.8E-06

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

Table 10UCL. Quantitative Risk Assessment - Carcinogenic

Residential Use - Dermal Contact/Surface soil.

For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				LADD	CR	LADD	CR	LADD	CR	LADD	CR
ARSENIC	5.7	UCL	2E+00	4E-07	6E-07	6E-09	9E-09	2E-07	3E-07	1E-06	2E-06
2,4,6-TRINITROTOLUENE	349.3	UCL									
Cancer Risk for Detected Compounds Only:				Sum =	6.0E-07	Sum =	9.4E-09	Sum =	3.2E-07	Sum =	1.7E-06
Cancer Risk for Detected and Nondetected Compounds:				Sum =	6.0E-07	Sum =	9.4E-09	Sum =	3.2E-07	Sum =	1.7E-06

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

**Table 11. Quantitative Risk Assessment - Noncarcinogenic
Residential Use - Dermal Contact/Subsurface Soil
For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.**

Analyte	Concentration (mg/kg)	Qualifier	Reference Dose (mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				ADD	HQ	ADD	HQ	ADD	HQ	ADD	HQ
ALUMINUM	32000		3E-01	2E-03	6E-03	8E-04	3E-03	2E-03	9E-03	2E-02	9E-02
ANTIMONY	17.1	L	4E-05	9E-07	2E-02	4E-07	1E-02	1E-06	3E-02	1E-05	3E-01
ARSENIC	22.4	J	3E-04	4E-06	1E-02	2E-06	6E-03	5E-06	2E-02	5E-05	2E-01
BARIUM	2780	J+	7E-02	2E-04	2E-03	7E-05	1E-03	2E-04	3E-03	2E-03	3E-02
CADMIUM	64.6	J	3E-05	4E-06	1E-01	2E-06	7E-02	5E-06	2E-01	5E-05	2E+00 *
CHROMIUM	206	J	3E-05	1E-05	4E-01	5E-06	2E-01	1E-05	5E-01	2E-04	5E+00 *
COPPER	2810	L	4E-02	2E-04	4E-03	7E-05	2E-03	2E-04	5E-03	2E-03	5E-02
IRON	80800	J+	6E-02	4E-03	7E-02	2E-03	3E-02	6E-03	1E-01	6E-02	1E+00
MANGANESE	1740	J	1E-03	1E-04	8E-02	4E-05	4E-02	1E-04	1E-01	1E-03	1E+00
THALLIUM	1.7	J	7E-05	9E-08	1E-03	4E-08	6E-04	1E-07	2E-03	1E-06	2E-02
VANADIUM	41.2		2E-05	2E-06	1E-01	1E-06	5E-02	3E-06	1E-01	3E-05	2E+00 *
ZINC	4280	+	7E-02	2E-04	3E-03	1E-04	1E-03	3E-04	4E-03	3E-03	4E-02
2,4,6-TRINITROTOLUENE	30.5										
2-AMINO-4,6-DINITROTOLUENE	8.04										
4-AMINO-2,6-DINITROTOLUENE	7.08										
1,3-dinitrobenzene	2.5	U									

Hazard Index for Detected Compounds Only:	Sum =	8.3E-01	Sum =	3.9E-01	Sum =	1.1E+00	Sum =	1.1E+01 *
Hazard Index for Nondetected Compounds Only:	Sum =	--	Sum =	--	Sum =	--	Sum =	--
Hazard Index for Detected and Nondetected Compounds:	Sum =	8.3E-01	Sum =	3.9E-01	Sum =	1.1E+00	Sum =	1.1E+01 *

ADD = average daily dose (mg/kg/d). HQ = Hazard Quotient (unitless). Compounds printed in lowercase letters were not detected in any sample.

* Hazard quotient or hazard index exceeds 1.5.

Table 12. Quantitative Risk Assessment - Carcinogenic

Residential Use - Dermal Contact/Subsurface soil.

For Elkton Farm Firehole OU2, Route 40 and 279 Elkton, Cecil County, Maryland.

Analyte	Concentration (mg/kg)	Qualifier	Slope Factor (1/mg/kg/d)	Adult Resident		Construction Worker		Youth Resident		Child Resident	
				LADD	CR	LADD	CR	LADD	CR	LADD	CR
ARSENIC	22.4	J	2E+00	2E-06	2E-06	2E-08	4E-08	8E-07	1E-06	4E-06	6E-06
2,4,6-TRINITROTOLUENE	30.5										
Cancer Risk for Detected Compounds Only:				Sum =	2.4E-06	Sum =	3.7E-08	Sum =	1.3E-06	Sum =	6.5E-06
Cancer Risk for Detected and Nondetected Compounds:				Sum =	2.4E-06	Sum =	3.7E-08	Sum =	1.3E-06	Sum =	6.5E-06

LADD = lifetime average daily dose (mg/kg/d). CR = Cancer risk. Compounds printed in lowercase letters were not detected in any sample.

* Cancer risk exceeds 10E-4.

ATTACHMENT A

Attachment A. Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	MDE Groundwater Standard	Pass Tier 1 Screen ?	MDE Soil Standard (Residential)	Pass Tier 1 Screen ?
Soil										
Surface:										
No Standards Available										
S2	CALCIUM		Soil	5010		MG/KG	--	--		?
S7	DINITROTOLUENE ISOMERS (2,4- & 2,6-)		Soil	5.4	J	mg/kg	--	--		?
S5	MAGNESIUM		Soil	3220		MG/KG	--	--		?
S12	PERCHLORATE		Soil	0.0025	U	mg/kg	--	--		?
S2	POTASSIUM		Soil	1040		MG/KG	--	--		?
S2	SODIUM		Soil	195	J	MG/KG	--	--		?
Inorganics:										
S2	ALUMINUM	7429905	Soil	15963	UCL	MG/KG	--	--	7.80E+03	Fail
S2	ANTIMONY	7440360	Soil	5.2	UCL	MG/KG	--	--	1.20E+01	Pass
S2	ARSENIC	7440382	Soil	5.7	UCL	MG/KG	--	--	2.00E+00	Fail
S2	BARIUM	7440393	Soil	1960	MAX	MG/KG	--	--	5.50E+02	Fail
S3	BERYLLIUM	7440417	Soil	0.8		MG/KG	--	--	1.60E+01	Pass
S2	CADMIUM	7440439	Soil	5.7	UCL	MG/KG	--	--	3.90E+00	Fail
S5	CHROMIUM	18540299	Soil	147.8	UCL	MG/KG	--	--	2.30E+01	Fail
S2	COBALT	7440484	Soil	14.3	J	MG/KG	--	--	1.60E+02	Pass
S2	COPPER	7440508	Soil	2332	UCL	MG/KG	--	--	3.10E+02	Fail
S7	CYANIDE (FREE)	57125	Soil	2.1	J	MG/KG	--	--	1.60E+02	Pass
S2	IRON	7439896	Soil	29650	UCL	MG/KG	--	--	2.30E+03	Fail
S2	LEAD		Soil	852	J	MG/KG	--	--	4.00E+02	Fail
S1	MANGANESE	7439965	Soil	618.6	UCL	MG/KG	--	--	1.60E+02	Fail
S2	MERCURY	7439976	Soil	0.41	K	MG/KG	--	--	1.00E-01	Fail
S2	NICKEL	7440020	Soil	30.2	J	MG/KG	--	--	1.60E+02	Pass
S5	SELENIUM	7782492	Soil	1.75	UL	MG/KG	--	--	3.90E+01	Pass
S2	SILVER	7440224	Soil	2.2		MG/KG	--	--	3.90E+01	Pass
S2	THALLIUM	7440280	Soil	5.4	UCL	MG/KG	--	--	2.00E+00	Fail
S9	VANADIUM	7440622	Soil	33.6	UCL	MG/KG	--	--	5.50E+01	Pass
S2	ZINC	7440666	Soil	4560	MAX	MG/KG	--	--	2.30E+03	Fail

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

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Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	MDE Groundwater Standard	Pass Tier 1 Screen ?	MDE Soil Standard (Residential)	Pass Tier 1 Screen ?
Soil										
Surface:										
Organics:										
S7	1,3,5-TRINITROBENZENE		Soil	48	J	mg/kg	--	--		?
S12	1,3-DINITROBENZENE		Soil	12.5	U	mg/kg	--	--		?
S7	2,4,6-TRINITROTOLUENE		Soil	349.3	UCL	mg/kg	--	--		?
S3	2,4-DINITROTOLUENE	121142	Soil	0.025	U	mg/kg	--	--	1.60E+01	Pass
S10	2,6-DINITROTOLUENE	606202	Soil	0.025	U	mg/kg	--	--	7.80E+00	Pass
S3	2,6-DINITROTOLUENE	606202	Soil	0.025	U	mg/kg	--	--	7.80E+00	Pass
S6	2-AMINO-2,6-DINITROTOLUENE		Soil	0.233		mg/kg	--	--		?
S7	2-AMINO-4,6-DINITROTOLUENE		Soil	4.3	UCL	mg/kg	--	--		?
S3	2-NITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
S3	3-NITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
S7	4-AMINO-2,6-DINITROTOLUENE		Soil	2.5	UCL	mg/kg	--	--		?
S12	4-NITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
S9	HMX		Soil	0.05	U	mg/kg	--	--		?
S9	NITROBENZENE	98953	Soil	0.025	U	mg/kg	--	--	3.90E+00	Pass
S9	RDX		Soil	0.05	U	mg/kg	--	--		?
S9	TETRYL		Soil	0.05	U	mg/kg	--	--		?
Subsurface:										
No Standards Available										
SS9	2-DINITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS9	3-DINITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS9	4-DINITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS5	CALCIUM		Soil	11500		MG/KG	--	--		?
SS5	DINITROTOLUENE ISOMERS (2,4- & 2,6-)		Soil	0.219		mg/kg	--	--		?
SS5	MAGNESIUM		Soil	5270		MG/KG	--	--		?
SS8	PERCHLORATE		Soil	0.0025	U	mg/kg	--	--		?
SS10	POTASSIUM		Soil	1000		mg/kg	--	--		?
SS5	SODIUM		Soil	261	J	MG/KG	--	--		?

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

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Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	MDE Groundwater Standard	Pass Tier 1 Screen ?	MDE Soil Standard (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Inorganics:										
SS12	ALUMINUM	7429905	Soil	32000		MG/KG	--	--	7.80E+03	Fail
SS5	ANTIMONY	7440360	Soil	17.1	L	MG/KG	--	--	1.20E+01	Fail
SS5	ARSENIC	7440382	Soil	22.4	J	MG/KG	--	--	2.00E+00	Fail
SS5	BARIUM	7440393	Soil	2780	J+	MG/KG	--	--	5.50E+02	Fail
SS5	BERYLLIUM	7440417	Soil	1.5		MG/KG	--	--	1.60E+01	Pass
SS5	CADMIUM	7440439	Soil	64.6	J	MG/KG	--	--	3.90E+00	Fail
SS5	CHROMIUM	18540299	Soil	206	J	MG/KG	--	--	2.30E+01	Fail
SS12	COBALT	7440484	Soil	12.1		MG/KG	--	--	1.60E+02	Pass
SS5	COPPER	7440508	Soil	2810	L	MG/KG	--	--	3.10E+02	Fail
SS5	CYANIDE (FREE)	57125	Soil	3.8		MG/KG	--	--	1.60E+02	Pass
SS12	IRON	7439896	Soil	80800	J+	MG/KG	--	--	2.30E+03	Fail
SS5	LEAD		Soil	2860	J	MG/KG	--	--	4.00E+02	Fail
SS12	MANGANESE	7439965	Soil	1740	J	MG/KG	--	--	1.60E+02	Fail
SS12	MERCURY	7439976	Soil	0.33		MG/KG	--	--	1.00E-01	Fail
SS12	NICKEL	7440020	Soil	60.8	J	MG/KG	--	--	1.60E+02	Pass
SS5	SELENIUM	7782492	Soil	2.6	J	MG/KG	--	--	3.90E+01	Pass
SS5	SILVER	7440224	Soil	3.3		MG/KG	--	--	3.90E+01	Pass
SS5	THALLIUM	7440280	Soil	1.7	J	MG/KG	--	--	2.00E+00	Pass
SS7	VANADIUM	7440622	Soil	41.2		MG/KG	--	--	5.50E+01	Pass
SS5	ZINC	7440666	Soil	4280	+	MG/KG	--	--	2.30E+03	Fail
Organics:										
SS6	1,1,1-TRICHLOROETHANE	71556	Soil	0.005	U	mg/kg	--	--	2.20E+03	Pass
SS6	1,1,2,2-TETRACHLOROETHANE	79345	Soil	0.005	U	mg/kg	--	--	3.20E+00	Pass
SS6	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE		Soil	0.005	U	mg/kg	--	--		?
SS6	1,1,2-TRICHLOROETHANE	79005	Soil	0.005	U	mg/kg	--	--	1.10E+01	Pass
SS6	1,1-DICHLOROETHANE	75343	Soil	0.005	U	mg/kg	--	--	7.80E+02	Pass
SS6	1,1-DICHLOROETHENE	75354	Soil	0.005	U	mg/kg	--	--	1.10E+00	Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	MDE Groundwater Standard	Pass Tier 1 Screen ?	MDE Soil Standard (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Organics:										
SS6	1,2,4-TRICHLOROBENZENE	120821	Soil	0.005	U	mg/kg	--	--	7.80E+01	Pass
SS6	1,2-DIBROMO-3-CHLOROPROPANE	96128	Soil	0.005	U	mg/kg	--	--	4.60E-01	Pass
SS6	1,2-DIBROMOETHANE	106934	Soil	0.005	U	mg/kg	--	--	7.50E-03	Pass
SS6	1,2-DICHLOROBENZENE	95501	Soil	0.005	U	mg/kg	--	--	7.00E+02	Pass
SS6	1,2-DICHLOROETHANE	107062	Soil	0.005	U	mg/kg	--	--	7.00E+00	Pass
SS6	1,2-DICHLOROPROPANE	78875	Soil	0.005	U	mg/kg	--	--	9.40E+00	Pass
SS7	1,3,5-TRINITROBENZENE		Soil	1.2	J	mg/kg	--	--		?
SS6	1,3-DICHLOROBENZENE	541731	Soil	0.005	U	mg/kg	--	--	2.30E+02	Pass
SS7	1,3-DINITROBENZENE		Soil	2.5	U	mg/kg	--	--		?
SS6	1,4-DICHLOROBENZENE	106467	Soil	0.005	U	mg/kg	--	--	2.70E+01	Pass
SS7	2,4,6-TRINITROTOLUENE		Soil	30.5		mg/kg	--	--		?
SS8	2,4-DINITROTOLUENE	121142	Soil	0.025	U	mg/kg	--	--	1.60E+01	Pass
SS8	2,6-DINITROTOLUENE	606202	Soil	0.025	U	mg/kg	--	--	7.80E+00	Pass
SS5	2-AMINO-4,6-DINITROTOLUENE		Soil	8.04		mg/kg	--	--		?
SS6	2-BUTANONE	78933	Soil	0.005	U	mg/kg	--	--	4.70E+03	Pass
SS6	2-HEXANONE	591786	Soil	0.005	U	mg/kg	--	--	3.10E+02	Pass
SS10	2-NITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS11	3-NITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS5	4-AMINO-2,6-DINITROTOLUENE		Soil	7.08		mg/kg	--	--		?
SS6	4-METHYL-2-PENTANONE	108101	Soil	0.005	U	mg/kg	--	--	6.30E+02	Pass
SS10	4-NITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS5	ACETONE	67641	Soil	0.005	U	mg/kg	--	--	7.80E+02	Pass
SS3	BENZENE	71432	Soil	0.007	J	mg/kg	--	--	1.20E+01	Pass
SS3	BROMODICHLOROMETHANE	75274	Soil	0.005	U	mg/kg	--	--	1.00E+01	Pass
SS3	BROMOFORM	75252	Soil	0.005	U	mg/kg	--	--	8.10E+01	Pass
SS3	BROMOMETHANE	74839	Soil	0.005	U	mg/kg	--	--	1.10E+01	Pass
SS3	CARBON DISULFIDE	75150	Soil	0.005	U	mg/kg	--	--	7.80E+02	Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	MDE Groundwater Standard	Pass Tier 1 Screen ?	MDE Soil Standard (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Organics:										
SS3	CARBON TETRACHLORIDE	56235	Soil	0.005	U	mg/kg	--	--	4.90E+00	Pass
SS3	CHLOROBENZENE	108907	Soil	0.005	U	mg/kg	--	--	1.60E+02	Pass
SS3	CHLOROETHANE	75003	Soil	0.005	U	mg/kg	--	--	2.20E+02	Pass
SS5	CHLOROFORM	67663	Soil	0.005	U	mg/kg	--	--	1.00E+02	Pass
SS5	CHLOROMETHANE	74873	Soil	0.005	U	mg/kg	--	--	4.90E+01	Pass
SS5	CIS-1,2-DICHLOROETHENE	156592	Soil	0.005	U	mg/kg	--	--	7.80E+01	Pass
SS5	CIS-1,3-DICHLOROPROPENE	542756	Soil	0.005	U	mg/kg	--	--	6.40E+00	Pass
SS5	CYCLOHEXANE		Soil	0.005	U	mg/kg	--	--		?
SS5	DIBROMOCHLOROMETHANE	124481	Soil	0.005	U	mg/kg	--	--	7.60E+00	Pass
SS5	DICHLORODIFLUOROMETHANE		Soil	0.005	U	mg/kg	--	--		?
SS5	ETHYLBENZENE	100414	Soil	0.005	U	mg/kg	--	--	7.80E+02	Pass
SS10	HMX		Soil	0.05	U	mg/kg	--	--		?
SS5	ISOPROPYLBENZENE	98828	Soil	0.005	U	mg/kg	--	--	7.80E+02	Pass
SS5	METHYL ACETATE		Soil	0.005	U	mg/kg	--	--		?
SS5	METHYL TERT BUTYL ETHER	1634044	Soil	0.005	U	mg/kg	--	--	6.50E+02	Pass
SS5	METHYLCYCLOHEXANE		Soil	0.005	U	mg/kg	--	--		?
SS5	METHYLENE CHLORIDE	75092	Soil	0.005	U	mg/kg	--	--	8.50E+01	Pass
SS6	NITROBENZENE	98953	Soil	0.025	U	mg/kg	--	--	3.90E+00	Pass
SS8	RDX		Soil	0.05	U	mg/kg	--	--		?
SS5	STYRENE	100425	Soil	0.005	U	mg/kg	--	--	1.60E+03	Pass
SS5	TETRACHLOROETHENE	127184	Soil	0.005	U	mg/kg	--	--	1.20E+01	Pass
SS10	TETRYL		Soil	0.05	U	mg/kg	--	--		?
SS5	TOLUENE	108883	Soil	0.005	U	mg/kg	--	--	1.60E+03	Pass
SS5	TRANS-1,2-DICHLOROETHENE	156605	Soil	0.005	U	mg/kg	--	--	1.60E+02	Pass
SS5	TRANS-1,3-DICHLOROPROPENE	542756	Soil	0.005	U	mg/kg	--	--	6.40E+00	Pass
SS12	TRICHLOROETHENE	79016	Soil	0.14		mg/kg	--	--	5.80E+01	Pass
SS5	TRICHLOROFLUOROMETHANE		Soil	0.005	U	mg/kg	--	--		?

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Monday, April 25, 2005

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	MDE Groundwater Standard	Pass Tier 1 Screen ?	MDE Soil Standard (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Organics:										
SS5	VINYL CHLORIDE	75014	Soil	0.005	U	mg/kg	--	--	9.00E-02	Pass
SS5	XYLENES	1330207	Soil	0.005	U	mg/kg	--	--	1.60E+04	Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A. Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual	Units	Adjusted Tap Water RBC	Pass Tier 1 Screen ?	Adjusted Soil RBC (Residential)	Pass Tier 1 Screen ?
<u>Soil</u>										
Surface:										
No RBCs Available										
S2	CALCIUM		Soil	5010		MG/KG	--	--		?
S7	DINITROTOLUENE ISOMERS (2,4- & 2,6-)		Soil	5.4	J	mg/kg	--	--		?
S5	MAGNESIUM		Soil	3220		MG/KG	--	--		?
S5	PERCHLORATE		Soil	0.0025	U	mg/kg	--	--		?
S2	POTASSIUM		Soil	1040		MG/KG	--	--		?
S2	SODIUM		Soil	195	J	MG/KG	--	--		?
Inorganics:										
S10	ALUMINUM	7429905	Soil	15963	UCL	MG/KG	--	--	7.80E+03	* N Fail
S2	ANTIMONY	7440360	Soil	5.2	UCL	MG/KG	--	--	3.10E+00	* N Fail
S2	ARSENIC	7440382	Soil	5.7	UCL	MG/KG	--	--	4.30E-01	C Fail
S2	BARIUM	7440393	Soil	1960	MAX	MG/KG	--	--	5.50E+02	* N Fail
S3	BERYLLIUM	7440417	Soil	0.8		MG/KG	--	--	1.60E+01	* N Pass
S3	CADMIUM	7440439	Soil	5.7	UCL	MG/KG	--	--	7.80E+00	* N Pass
S2	CHROMIUM	18540299	Soil	147.8	UCL	MG/KG	--	--	2.30E+01	* N Fail
S2	COBALT	7440484	Soil	14.3	J	MG/KG	--	--	1.56E+02	* N Pass
S2	COPPER	7440508	Soil	2332	UCL	MG/KG	--	--	3.10E+02	* N Fail
S7	CYANIDE (FREE)	57125	Soil	2.1	J	MG/KG	--	--	1.60E+02	* N Pass
S2	IRON	7439896	Soil	29650	UCL	MG/KG	--	--	2.35E+03	* N Fail
S2	LEAD		Soil	852	J	MG/KG	--	--		?
S3	MANGANESE	7439965	Soil	618.6	UCL	MG/KG	--	--	1.60E+02	* N Fail
S2	MERCURY	7439976	Soil	0.41	K	MG/KG	--	--	1.00E-06	MDE Fail
S2	NICKEL	7440020	Soil	30.2	J	MG/KG	--	--	1.60E+02	* N Pass
S8	SELENIUM	7782492	Soil	1.75	UL	MG/KG	--	--	3.90E+01	* N Pass
S2	SILVER	7440224	Soil	2.2		MG/KG	--	--	3.90E+01	* N Pass
S2	THALLIUM	7440280	Soil	5.4	UCL	MG/KG	--	--	5.50E-01	* N Fail
S9	VANADIUM	7440622	Soil	33.6	UCL	MG/KG	--	--	7.80E+00	* N Fail
S2	ZINC	7440666	Soil	4560	MAX	MG/KG	--	--	2.30E+03	* N Fail

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	Adjusted Tap Water RBC	Pass Tier 1 Screen ?	Adjusted Soil RBC (Residential)	Pass Tier 1 Screen ?
Soil										
Surface:										
Organics:										
S7	1,3,5-TRINITROBENZENE	99354	Soil	48	J	mg/kg	--	--	2.30E+02	* N Pass
S12	1,3-DINITROBENZENE	99650	Soil	12.5	U	mg/kg	--	--	7.80E-01	* N Fail
S7	2,4,6-TRINITROTOLUENE	118967	Soil	349.3	UCL	mg/kg	--	--	2.10E+01	C Fail
S1	2,4-DINITROTOLUENE	121142	Soil	0.025	U	mg/kg	--	--	1.60E+01	* N Pass
S11	2,6-DINITROTOLUENE	606202	Soil	0.025	U	mg/kg	--	--	7.80E+00	* N Pass
S1	2-6-DINITROTOLUENE	606202	Soil	0.025	U	mg/kg	--	--	7.80E+00	* N Pass
S6	2-AMINO-2,6-DINITROTOLUENE		Soil	0.233		mg/kg	--	--	1.60E+00	* N Pass
S7	2-AMINO-4,6-DINITROTOLUENE		Soil	4.3	UCL	mg/kg	--	--	1.60E+00	* N Fail
S10	2-NITROTOLUENE	88722	Soil	0.025	U	mg/kg	--	--	2.80E+00	C Pass
S1	3-NITROTOLUENE	99081	Soil	0.025	U	mg/kg	--	--	1.60E+02	* N Pass
S7	4-AMINO-2,6-DINITROTOLUENE		Soil	2.5	UCL	mg/kg	--	--	1.60E+00	* N Fail
S10	4-NITROTOLUENE	99990	Soil	0.025	U	mg/kg	--	--	3.80E+01	C Pass
S8	HMX	2691410	Soil	0.05	U	mg/kg	--	--	3.90E+02	* N Pass
S1	NITROBENZENE	98953	Soil	0.025	U	mg/kg	--	--	3.90E+00	* N Pass
S12	RDX	121824	Soil	0.05	U	mg/kg	--	--	5.80E+00	C Pass
S7	TETRYL	479458	Soil	0.05	U	mg/kg	--	--	7.80E+01	* N Pass
Subsurface:										
No RBCs Available										
SS9	2-DINITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS9	3-DINITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS9	4-DINITROTOLUENE		Soil	0.025	U	mg/kg	--	--		?
SS5	CALCIUM		Soil	11500		MG/KG	--	--		?
SS5	DINITROTOLUENE ISOMERS (2,4- & 2,6-)		Soil	0.219		mg/kg	--	--		?
SS5	MAGNESIUM		Soil	5270		MG/KG	--	--		?
SS12	PERCHLORATE		Soil	0.0025	U	mg/kg	--	--		?
SS10	POTASSIUM		Soil	1000		mg/kg	--	--		?
SS5	SODIUM		Soil	261	J	MG/KG	--	--		?

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	Adjusted Tap Water RBC	Pass Tier 1 Screen ?	Adjusted Soil RBC (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Inorganics:										
SS12	ALUMINUM	7429905	Soil	32000		MG/KG	--	--	7.80E+03	* N Fail
SS5	ANTIMONY	7440360	Soil	17.1	L	MG/KG	--	--	3.10E+00	* N Fail
SS5	ARSENIC	7440382	Soil	22.4	J	MG/KG	--	--	4.30E-01	C Fail
SS5	BARIUM	7440393	Soil	2780	J+	MG/KG	--	--	5.50E+02	* N Fail
SS5	BERYLLIUM	7440417	Soil	1.5		MG/KG	--	--	1.60E+01	* N Pass
SS5	CADMIUM	7440439	Soil	64.6	J	MG/KG	--	--	7.80E+00	* N Fail
SS5	CHROMIUM	18540299	Soil	206	J	MG/KG	--	--	2.30E+01	* N Fail
SS12	COBALT	7440484	Soil	12.1		MG/KG	--	--	1.56E+02	* N Pass
SS5	COPPER	7440508	Soil	2810	L	MG/KG	--	--	3.10E+02	* N Fail
SS5	CYANIDE (FREE)	57125	Soil	3.8		MG/KG	--	--	1.60E+02	* N Pass
SS12	IRON	7439896	Soil	80800	J+	MG/KG	--	--	2.35E+03	* N Fail
SS5	LEAD		Soil	2860	J	MG/KG	--	--		?
SS12	MANGANESE	7439965	Soil	1740	J	MG/KG	--	--	1.60E+02	* N Fail
SS12	MERCURY	7439976	Soil	0.33		MG/KG	--	--	1.00E-06	MDE Fail
SS12	NICKEL	7440020	Soil	60.8	J	MG/KG	--	--	1.60E+02	* N Pass
SS5	SELENIUM	7782492	Soil	2.6	J	MG/KG	--	--	3.90E+01	* N Pass
SS5	SILVER	7440224	Soil	3.3		MG/KG	--	--	3.90E+01	* N Pass
SS5	THALLIUM	7440280	Soil	1.7	J	MG/KG	--	--	5.50E-01	* N Fail
SS7	VANADIUM	7440622	Soil	41.2		MG/KG	--	--	7.80E+00	* N Fail
SS5	ZINC	7440666	Soil	4280	+	MG/KG	--	--	2.30E+03	* N Fail
Organics:										
SS11	1,1,1-TRICHLOROETHANE	71556	Soil	0.005	U	mg/kg	--	--	2.20E+03	* N Pass
SS11	1,1,2,2-TETRACHLOROETHANE	79345	Soil	0.005	U	mg/kg	--	--	3.20E+00	C Pass
SS11	1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76131	Soil	0.005	U	mg/kg	--	--	2.30E+05	* N Pass
SS11	1,1,2-TRICHLOROETHANE	79005	Soil	0.005	U	mg/kg	--	--	1.10E+01	C Pass
SS11	1,1-DICHLOROETHANE	75343	Soil	0.005	U	mg/kg	--	--	7.80E+02	* N Pass
SS11	1,1-DICHLOROETHENE	75354	Soil	0.005	U	mg/kg	--	--	3.90E+02	* N Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	Adjusted Tap Water RBC	Pass Tier 1 Screen ?	Adjusted Soil RBC (Residential)	Pass Tier 1 Screen ?	
Soil											
Subsurface:											
Organics:											
SS11	1,2,4-TRICHLOROBENZENE	120821	Soil	0.005	U	mg/kg	--	--	7.80E+01	* N	Pass
SS10	1,2-DIBROMO-3-CHLOROPROPANE	96128	Soil	0.005	U	mg/kg	--	--	4.60E-01	C	Pass
SS11	1,2-DIBROMOETHANE	106934	Soil	0.005	U	mg/kg	--	--	7.50E-03	C	Pass
SS11	1,2-DICHLOROBENZENE	95501	Soil	0.005	U	mg/kg	--	--	7.04E+02	* N	Pass
SS11	1,2-DICHLOROETHANE	107062	Soil	0.005	U	mg/kg	--	--	7.00E+00	C	Pass
SS11	1,2-DICHLOROPROPANE	78875	Soil	0.005	U	mg/kg	--	--	9.40E+00	C	Pass
SS7	1,3,5-TRINITROBENZENE	99354	Soil	1.2	J	mg/kg	--	--	2.30E+02	* N	Pass
SS11	1,3-DICHLOROBENZENE	541731	Soil	0.005	U	mg/kg	--	--	2.35E+02	* N	Pass
SS7	1,3-DINITROBENZENE	99650	Soil	2.5	U	mg/kg	--	--	7.80E-01	* N	Fail
SS11	1,4-DICHLOROBENZENE	106467	Soil	0.005	U	mg/kg	--	--	2.70E+01	C	Pass
SS7	2,4,6-TRINITROTOLUENE	118967	Soil	30.5		mg/kg	--	--	2.10E+01	C	Fail
SS11	2,4-DINITROTOLUENE	121142	Soil	0.025	U	mg/kg	--	--	1.60E+01	* N	Pass
SS11	2,6-DINITROTOLUENE	606202	Soil	0.025	U	mg/kg	--	--	7.80E+00	* N	Pass
SS5	2-AMINO-4,6-DINITROTOLUENE		Soil	8.04		mg/kg	--	--	1.60E+00	* N	Fail
SS11	2-BUTANONE	78933	Soil	0.005	U	mg/kg	--	--	4.70E+03	* N	Pass
SS11	2-HEXANONE	591786	Soil	0.005	U	mg/kg	--	--	3.10E+02	* N	Pass
SS10	2-NITROTOLUENE	88722	Soil	0.025	U	mg/kg	--	--	2.80E+00	C	Pass
SS11	3-NITROTOLUENE	99081	Soil	0.025	U	mg/kg	--	--	1.60E+02	* N	Pass
SS5	4-AMINO-2,6-DINITROTOLUENE		Soil	7.08		mg/kg	--	--	1.60E+00	* N	Fail
SS11	4-METHYL-2-PENTANONE	108101	Soil	0.005	U	mg/kg	--	--			?
SS10	4-NITROTOLUENE	99990	Soil	0.025	U	mg/kg	--	--	3.80E+01	C	Pass
SS11	ACETONE	67641	Soil	0.005	U	mg/kg	--	--	7.00E+03	* N	Pass
SS3	BENZENE	71432	Soil	0.007	J	mg/kg	--	--	1.20E+01	C	Pass
SS11	BROMODICHLOROMETHANE	75274	Soil	0.005	U	mg/kg	--	--	1.00E+01	C	Pass
SS11	BROMOFORM	75252	Soil	0.005	U	mg/kg	--	--	8.10E+01	C	Pass
SS11	BROMOMETHANE	74839	Soil	0.005	U	mg/kg	--	--	1.10E+01	* N	Pass
SS11	CARBON DISULFIDE	75150	Soil	0.005	U	mg/kg	--	--	7.80E+02	* N	Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	Adjusted Tap Water RBC	Pass Tier 1 Screen ?	Adjusted Soil RBC (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Organics:										
SS11	CARBON TETRACHLORIDE	56235	Soil	0.005	U	mg/kg	--	--	4.90E+00	C Pass
SS11	CHLOROBENZENE	108907	Soil	0.005	U	mg/kg	--	--	1.60E+02	* N Pass
SS11	CHLOROETHANE	75003	Soil	0.005	U	mg/kg	--	--	2.20E+02	C Pass
SS11	CHLOROFORM	67663	Soil	0.005	U	mg/kg	--	--	7.80E+01	* N Pass
SS11	CHLOROMETHANE	74873	Soil	0.005	U	mg/kg	--	--		? ?
SS11	CIS-1,2-DICHLOROETHENE	156592	Soil	0.005	U	mg/kg	--	--	7.80E+01	* N Pass
SS11	CIS-1,3-DICHLOROPROPENE	542756	Soil	0.005	U	mg/kg	--	--	6.40E+00	C Pass
SS11	CYCLOHEXANE	110827	Soil	0.005	U	mg/kg	--	--		? ?
SS11	DIBROMOCHLOROMETHANE	124481	Soil	0.005	U	mg/kg	--	--	7.60E+00	C Pass
SS11	DICHLORODIFLUOROMETHANE	75718	Soil	0.005	U	mg/kg	--	--	1.60E+03	* N Pass
SS11	ETHYLBENZENE	100414	Soil	0.005	U	mg/kg	--	--	7.80E+02	* N Pass
SS11	HMX	2691410	Soil	0.05	U	mg/kg	--	--	3.90E+02	* N Pass
SS11	ISOPROPYLBENZENE	98828	Soil	0.005	U	mg/kg	--	--	7.80E+02	* N Pass
SS11	METHYL ACETATE	79209	Soil	0.005	U	mg/kg	--	--	7.80E+03	* N Pass
SS11	METHYL TERT BUTYL ETHER	1634044	Soil	0.005	U	mg/kg	--	--	1.60E+00	C Pass
SS11	METHYLCYCLOHEXANE	108872	Soil	0.005	U	mg/kg	--	--		? ?
SS11	METHYLENE CHLORIDE	75092	Soil	0.005	U	mg/kg	--	--	8.50E+01	C Pass
SS10	NITROBENZENE	98953	Soil	0.025	U	mg/kg	--	--	3.90E+00	* N Pass
SS11	RDX	121824	Soil	0.05	U	mg/kg	--	--	5.80E+00	C Pass
SS11	STYRENE	100425	Soil	0.005	U	mg/kg	--	--	1.60E+03	* N Pass
SS11	TETRACHLOROETHENE	127184	Soil	0.005	U	mg/kg	--	--	1.20E+00	C Pass
SS10	TETRYL	479458	Soil	0.05	U	mg/kg	--	--	7.80E+01	* N Pass
SS10	TOLUENE	108883	Soil	0.005	U	mg/kg	--	--	1.60E+03	* N Pass
SS10	TRANS-1,2-DICHLOROETHENE	156605	Soil	0.005	U	mg/kg	--	--	1.60E+02	* N Pass
SS11	TRANS-1,3-DICHLOROPROPENE	542756	Soil	0.005	U	mg/kg	--	--	6.40E+00	C Pass
SS12	TRICHLOROETHENE	79016	Soil	0.14		mg/kg	--	--	1.60E+00	C Pass
SS11	TRICHLOROFLUOROMETHANE	75694	Soil	0.005	U	mg/kg	--	--	2.30E+03	* N Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

Attachment A (cont.). Identification of Chemicals of Concern: Elkton Farm Firehole OU2, Elkton, Cecil County, Maryland; PCA Code: 65554-2

Sample ID	Analyte	CAS	Matrix	Concentration	Qual.	Units	Adjusted Tap Water RBC	Pass Tier 1 Screen ?	Adjusted Soil RBC (Residential)	Pass Tier 1 Screen ?
Soil										
Subsurface:										
Organics:										
SS10	VINYL CHLORIDE	75014	Soil	0.005	U	mg/kg	--	--	9.00E-02	C Pass
SS10	XYLENES	1330207	Soil	0.005	U	mg/kg	--	--	1.60E+03	* N Pass

* RBC adjusted for non-carcinogenic additive effects; N = non-carcinogenic; C = carcinogenic. Note: no RBC value exists for inorganic mercury; the screening value was arbitrarily set at 1E-6 for soil and water.

General Statistics

From File			
Summary Statistics for			arsenic s
Number of Samples			11
Minimum			3
Maximum			9.5
Mean			4.654545
Median			4.4
Standard Deviation			1.78738
Variance			3.194727
Coefficient of Variation			0.384007
Skewness			2.222711
Shapiro-Wilk Test Statistic			0.754615
Shapiro-Wilk 5% Critical Value			0.85
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95% UCL (Normal Data)			
Student's t			5.631309
95% UCL (Adjusted for Skewness)			
Adjusted CLT			5.926894
Modified t			5.691503
95% Non-parametric UCL			
CLT			5.540982
Jackknife			5.631309
Standard Bootstrap			5.503949
Bootstrap t			6.420471
Chebyshev (Mean, Std)			7.003623

General Statistics

From File					
Summary Statistics for	arsenic s		Summary Statistics for	ln(arsenic s	
Number of Samples	11		Minimum	1.098612	
Minimum	3		Maximum	2.251292	
Maximum	9.5		Mean	1.486309	
Mean	4.654545		Standard Deviation	0.318034	
Median	4.4		Variance	0.101145	
Standard Deviation	1.78738				
Variance	3.194727		Shapiro-Wilk Test Statistic	0.884414	
Coefficient of Variation	0.384007		Shapiro-Wilk 5% Critical Value	0.85	
Skewness	2.222711		Data Are Lognormal at 5% Significance Level		
95% UCL (Normal Data)			Estimates Assuming Lognormal Distribution		
Student's t	5.631309		MLE Mean	4.650068	
			MLE Standard Deviation	1.517073	
95% UCL (Adjusted for Skewness)			MLE Coefficient of Variation	0.326247	
Adjusted CLT	5.926894		MLE Skewness	1.013467	
Modified t	5.691503		MLE Median	4.420749	
			MLE 80% Quantile	5.783722	
95% Non-parametric UCL			MLE 90% Quantile	6.65243	
CLT	5.540982		MLE 95% Quantile	7.459394	
Jackknife	5.631309		MLE 99% Quantile	9.263251	
Standard Bootstrap	5.500339				
Bootstrap t	6.384644		MVU Estimate of Median	4.400463	
Chebyshev (Mean, Std)	7.003623		MVU Estimate of Mean	4.62793	
			MVU Estimate of Std. Dev.	1.485802	
			MVU Estimate of SE of Mean	0.447824	
			UCL Assuming Lognormal Distribution		
			95% H-UCL	5.668897	
			95% Chebyshev (MVUE) UCL	6.579949	
			99% Chebyshev (MVUE) UCL	9.083722	
			Recommended UCL to use:		
			Student's t or H-UCL		

General Statistics

From File				
Summary Statistics for		aluminum s		
Number of Samples		11		
Minimum		9540		
Maximum		19800		
Mean		14058.18		
Median		12900		
Standard Deviation		3486.321		
Variance		12154436		
Coefficient of Variation		0.247992		
Skewness		0.538968		
Shapiro-Wilk Test Statistic		0.900627		
Shapiro-Wilk 5% Critical Value		0.85		
Data Are Normal at 0.05 Significance Level				
Recommended UCL to use		Student's t		
95% UCL (Normal Data)				
Student's t		15963.38		
95% UCL (Adjusted for Skewness)				
Adjusted CLT		15969.72		
Modified t		15991.85		
95% Non-parametric UCL				
CLT		15787.2		
Jackknife		15963.38		
Standard Bootstrap		15695.02		
Bootstrap t		16243.27		
Chebyshev (Mean, Std)		18640.11		

General Statistics

From File				
Summary Statistics for	antimony s			
Number of Samples	11			
Minimum	0.25			
Maximum	9.4			
Mean	2.135455			
Median	1.7			
Standard Deviation	2.558075			
Variance	6.543747			
Coefficient of Variation	1.197907			
Skewness	2.659696			
Shapiro-Wilk Test Statistic	0.66341			
Shapiro-Wilk 5% Critical Value	0.85			
Data Not Normal at 0.05 Significance Level				
Try Lognormal or Non-parametric UCL				
95 % UCL (Normal Data)				
Student's t	3.533385			
95 % UCL (Adjusted for Skewness)				
Adjusted CLT	4.065007			
Modified t	3.636472			
95 % Non-parametric UCL				
CLT	3.404111			
Jackknife	3.533385			
Standard Bootstrap	3.312165			
Bootstrap t	5.32576			
Chebyshev (Mean, Std)	5.497424			

General Statistics

From File						
Summary Statistics for		antimony s	Summary Statistics for		ln(antimony	
Number of Samples		11	Minimum		-1.386294	
Minimum		0.25	Maximum		2.24071	
Maximum		9.4	Mean		0.269708	
Mean		2.135455	Standard Deviation		1.04587	
Median		1.7	Variance		1.093844	
Standard Deviation		2.558075				
Variance		6.543747	Shapiro-Wilk Test Statistic		0.955821	
Coefficient of Variation		1.197907	Shapiro-Wilk 5% Critical Value		0.85	
Skewness		2.659696	Data Are Lognormal at 5% Significance Level			
95 % UCL (Normal Data)			Estimates Assuming Lognormal Distribution			
Student's t		3.533385	MLE Mean		2.262861	
95 % UCL (Adjusted for Skewness)			MLE Standard Deviation		3.188732	
Adjusted CLT		4.065007	MLE Coefficient of Variation		1.409159	
Modified t		3.636472	MLE Skewness		7.025688	
95 % Non-parametric UCL			MLE Median		1.309582	
CLT		3.404111	MLE 80% Quantile		3.169165	
Jackknife		3.533385	MLE 90% Quantile		5.02111	
Standard Bootstrap		3.347665	MLE 95% Quantile		7.316736	
Bootstrap t		5.326507	MLE 99% Quantile		14.91551	
Chebyshev (Mean, Std)		5.497424	MVU Estimate of Median		1.245802	
			MVU Estimate of Mean		2.112882	
			MVU Estimate of Std. Dev.		2.419259	
			MVU Estimate of SE of Mean		0.707953	
			UCL Assuming Lognormal Distribution			
			95% H-UCL		6.304735	
			95% Chebyshev (MVUE) UCL		5.198778	
			99% Chebyshev (MVUE) UCL		9.156926	
			Recommended UCL to use:			
			95 % Chebyshev (MVUE) UCL			

General Statistics

From File				
Summary Statistics for			barium s	
Number of Samples			11	
Minimum			26.4	
Maximum			1960	
Mean			608.0455	
Median			576	
Standard Deviation			544.1131	
Variance			296059.1	
Coefficient of Variation			0.894856	
Skewness			1.529889	
Shapiro-Wilk Test Statistic			0.848221	
Shapiro-Wilk 5% Critical Value			0.85	
Data Not Normal at 0.05 Significance Level				
Try Lognormal or Non-parametric UCL				
95% UCL (Normal Data)				
Student's t			905.3911	
95% UCL (Adjusted for Skewness)				
Adjusted CLT			958.7546	
Modified t			918.0037	
95% Non-parametric UCL				
CLT			877.894	
Jackknife			905.3911	
Standard Bootstrap			864.9848	
Bootstrap t			1048.887	
Chebyshev (Mean, Std)			1323.15	

General Statistics

From File						
Summary Statistics for		barium s	Summary Statistics for		ln(barium s	
Number of Samples		11	Minimum		3.273364	
Minimum		26.4	Maximum		7.5807	
Maximum		1960	Mean		5.862453	
Mean		608.0455	Standard Deviation		1.332641	
Median		576	Variance		1.775933	
Standard Deviation		544.1131	Shapiro-Wilk Test Statistic		0.870109	
Variance		296059.1	Shapiro-Wilk 5% Critical Value		0.85	
Coefficient of Variation		0.894856	Data Are Lognormal at 5% Significance Level			
Skewness		1.529889				
95% UCL (Normal Data)			Estimates Assuming Lognormal Distribution			
Student's t		905.3911	MLE Mean		854.4168	
			MLE Standard Deviation		1892.449	
95% UCL (Adjusted for Skewness)			MLE Coefficient of Variation		2.214902	
Adjusted CLT		958.7546	MLE Skewness		17.51054	
Modified t		918.0037	MLE Median		351.5854	
			MLE 80% Quantile		1084.132	
95% Non-parametric UCL			MLE 90% Quantile		1948.659	
CLT		877.894	MLE 95% Quantile		3148.394	
Jackknife		905.3911	MLE 99% Quantile		7802.32	
Standard Bootstrap		866.1225	MVU Estimate of Median		324.1404	
Bootstrap t		1041.685	MVU Estimate of Mean		751.7455	
Chebyshev (Mean, Std)		1323.15	MVU Estimate of Std. Dev.		1149.383	
			MVU Estimate of SE of Mean		324.6954	
			UCL Assuming Lognormal Distribution			
			95% H-UCL		4042.604	
			95% Chebyshev (MVUE) UCL		2167.06	
			99% Chebyshev (MVUE) UCL		3982.424	
			Recommended UCL to use:			
			95 % Chebyshev (MVUE) UCL			

General Statistics

From File			
Summary Statistics for			cadmium s
Number of Samples			11
Minimum			0.25
Maximum			13.6
Mean			3.398182
Median			2.4
Standard Deviation			4.143259
Variance			17.1666
Coefficient of Variation			1.219258
Skewness			1.640136
Shapiro-Wilk Test Statistic			0.787421
Shapiro-Wilk 5% Critical Value			0.85
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t			5.66238
95 % UCL (Adjusted for Skewness)			
Adjusted CLT			6.113098
Modified t			5.765342
95 % Non-parametric UCL			
CLT			5.452998
Jackknife			5.66238
Standard Bootstrap			5.346127
Bootstrap t			7.127437
Chebyshev (Mean, Std)			8.843491

General Statistics

From File					
Summary Statistics for	cadmium s		Summary Statistics for	ln(cadmium	
Number of Samples	11		Minimum	-1.386294	
Minimum	0.25		Maximum	2.61007	
Maximum	13.6		Mean	0.295182	
Mean	3.398182		Standard Deviation	1.591455	
Median	2.4		Variance	2.532729	
Standard Deviation	4.143259				
Variance	17.1666		Shapiro-Wilk Test Statistic	0.829924	
Coefficient of Variation	1.219258		Shapiro-Wilk 5% Critical Value	0.85	
Skewness	1.640136		Data Not Lognormal at 5% Significance Level		
			Try Normal or Non-parametric UCL		
95% UCL (Normal Data)					
Student's t	5.66238		Estimates Assuming Lognormal Distribution		
			MLE Mean	4.766184	
95% UCL (Adjusted for Skewness)			MLE Standard Deviation	16.22451	
Adjusted CLT	6.113098		MLE Coefficient of Variation	3.404087	
Modified t	5.765342		MLE Skewness	49.65819	
			MLE Median	1.34337	
95% Non-parametric UCL			MLE 80% Quantile	5.154968	
CLT	5.452998		MLE 90% Quantile	10.38333	
Jackknife	5.66238		MLE 95% Quantile	18.41425	
Standard Bootstrap	5.385867		MLE 99% Quantile	54.42948	
Bootstrap t	6.9494				
Chebyshev (Mean, Std)	8.843491		MVU Estimate of Median	1.195935	
			MVU Estimate of Mean	3.876849	
			MVU Estimate of Std. Dev.	7.41358	
			MVU Estimate of SE of Mean	2.001362	
			UCL Assuming Lognormal Distribution		
			95% H-UCL	40.52505	
			95% Chebyshev (MVUE) UCL	12.60059	
			99% Chebyshev (MVUE) UCL	23.79015	
			Recommended UCL to use:		
			99 % Chebyshev (MVUE) UCL		

General Statistics

From File			
Summary Statistics for	chromium		
Number of Samples	11		
Minimum	15		
Maximum	289		
Mean	67.37273		
Median	29.1		
Standard Deviation	83.7436		
Variance	7012.99		
Coefficient of Variation	1.24299		
Skewness	2.284699		
Shapiro-Wilk Test Statistic	0.651692		
Shapiro-Wilk 5% Critical Value	0.85		
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t	113.1367		
95 % UCL (Adjusted for Skewness)			
Adjusted CLT	127.4899		
Modified t	116.0356		
95 % Non-parametric UCL			
CLT	108.9047		
Jackknife	113.1367		
Standard Bootstrap	108.0196		
Bootstrap t	246.2523		
Chebyshev (Mean, Std)	177.4334		

General Statistics

From File					
Summary Statistics for	chromium		Summary Statistics for	ln(chromium)	
Number of Samples	11		Minimum	2.70805	
Minimum	15		Maximum	5.666427	
Maximum	289		Mean	3.741377	
Mean	67.37273		Standard Deviation	0.919926	
Median	29.1		Variance	0.846263	
Standard Deviation	83.7436				
Variance	7012.99		Shapiro-Wilk Test Statistic	0.876103	
Coefficient of Variation	1.24299		Shapiro-Wilk 5% Critical Value	0.85	
Skewness	2.284699		Data Are Lognormal at 5% Significance Level		
95% UCL (Normal Data)			Estimates Assuming Lognormal Distribution		
Student's t	113.1367		MLE Mean	64.36107	
			MLE Standard Deviation	74.25049	
95% UCL (Adjusted for Skewness)			MLE Coefficient of Variation	1.153655	
Adjusted CLT	127.4899		MLE Skewness	4.996389	
Modified t	116.0356		MLE Median	42.15602	
			MLE 80% Quantile	91.71763	
95% Non-parametric UCL			MLE 90% Quantile	137.4805	
CLT	108.9047		MLE 95% Quantile	191.4554	
Jackknife	113.1367		MLE 99% Quantile	358.2118	
Standard Bootstrap	109.5563				
Bootstrap t	246.2002		MVU Estimate of Median	40.56017	
Chebyshev (Mean, Std)	177.4334		MVU Estimate of Mean	61.22399	
			MVU Estimate of Std. Dev.	60.52584	
			MVU Estimate of SE of Mean	17.89985	
			UCL Assuming Lognormal Distribution		
			95% H-UCL	147.7631	
			95% Chebyshev (MVUE) UCL	139.2476	
			99% Chebyshev (MVUE) UCL	239.3253	
			Recommended UCL to use:		
			H-UCL		

General Statistics

From File			
Summary Statistics for		copper s	
Number of Samples		11	
Minimum		6.2	
Maximum		10200	
Mean		1050.109	
Median		120	
Standard Deviation		3037.56	
Variance		9226769	
Coefficient of Variation		2.892614	
Skewness		3.305177	
Shapiro-Wilk Test Statistic		0.382416	
Shapiro-Wilk 5% Critical Value		0.85	
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t		2710.067	
95 % UCL (Adjusted for Skewness)			
Adjusted CLT		3531.793	
Modified t		2862.184	
95 % Non-parametric UCL			
CLT		2556.563	
Jackknife		2710.067	
Standard Bootstrap		2490.414	
Bootstrap t		29505.27	
Chebyshev (Mean, Std)		5042.245	

General Statistics

From File						
Summary Statistics for		copper s	Summary Statistics for		ln(copper s	
Number of Samples		11	Minimum		1.824549	
Minimum		6.2	Maximum		9.230143	
Maximum		10200	Mean		4.601491	
Mean		1050.109	Standard Deviation		2.120433	
Median		120	Variance		4.496237	
Standard Deviation		3037.56	Shapiro-Wilk Test Statistic		0.927426	
Variance		9226769	Shapiro-Wilk 5% Critical Value		0.85	
Coefficient of Variation		2.892614	Data Are Lognormal at 5% Significance Level			
Skewness		3.305177				
95% UCL (Normal Data)			Estimates Assuming Lognormal Distribution			
Student's t		2710.067	MLE Mean		943.5126	
			MLE Standard Deviation		8885.013	
95% UCL (Adjusted for Skewness)			MLE Coefficient of Variation		9.416952	
Adjusted CLT		3531.793	MLE Skewness		863.3367	
Modified t		2862.184	MLE Median		99.6328	
			MLE 80% Quantile		597.8007	
95% Non-parametric UCL			MLE 90% Quantile		1519.669	
CLT		2556.563	MLE 95% Quantile		3260.396	
Jackknife		2710.067	MLE 99% Quantile		13816.5	
Standard Bootstrap		2472.589	MVU Estimate of Median		80.92265	
Bootstrap t		30923.44	MVU Estimate of Mean		595.2906	
Chebyshev (Mean, Std)		5042.245	MVU Estimate of Std. Dev.		1677.758	
			MVU Estimate of SE of Mean		398.3193	
			UCL Assuming Lognormal Distribution			
			95% H-UCL		36626.72	
			95% Chebyshev (MVUE) UCL		2331.524	
			99% Chebyshev (MVUE) UCL		4558.517	
			Recommended UCL to use:			
			99 % Chebyshev (MVUE) UCL			

General Statistics

From File				
Summary Statistics for		Iron s		
Number of Samples		11		
Minimum		12000		
Maximum		57200		
Mean		22754.55		
Median		20000		
Standard Deviation		12206.42		
Variance		1.5E+008		
Coefficient of Variation		0.536439		
Skewness		2.576176		
Shapiro-Wilk Test Statistic		0.683511		
Shapiro-Wilk 5% Critical Value		0.85		
Data Not Normal at 0.05 Significance Level				
Try Lognormal or Non-parametric UCL				
95 % UCL (Normal Data)				
Student's t		29425.08		
95 % UCL (Adjusted for Skewness)				
Adjusted CLT		31862.8		
Modified t		29901.53		
95 % Non-parametric UCL				
CLT		28808.22		
Jackknife		29425.08		
Standard Bootstrap		28578.44		
Bootstrap t		37281.86		
Chebyshev (Mean, Std)		38796.93		

General Statistics

From File					
Summary Statistics for		Iron s	Summary Statistics for		ln(Iron s)
Number of Samples		11	Minimum		9.392662
Minimum		12000	Maximum		10.95431
Maximum		57200	Mean		9.942376
Mean		22754.55	Standard Deviation		0.412096
Median		20000	Variance		0.169823
Standard Deviation		12206.42			
Variance		1.5E+008	Shapiro-Wilk Test Statistic		0.874447
Coefficient of Variation		0.536439	Shapiro-Wilk 5% Critical Value		0.85
Skewness		2.576176	Data Are Lognormal at 5% Significance Level		
95% UCL (Normal Data)			Estimates Assuming Lognormal Distribution		
Student's t		29425.08	MLE Mean		22635.79
			MLE Standard Deviation		9738.536
95% UCL (Adjusted for Skewness)			MLE Coefficient of Variation		0.430227
Adjusted CLT		31862.8	MLE Skewness		1.370315
Modified t		29901.53	MLE Median		20793.08
			MLE 80% Quantile		29454.36
95% Non-parametric UCL			MLE 90% Quantile		35309.93
CLT		28808.22	MLE 95% Quantile		40956.85
Jackknife		29425.08	MLE 99% Quantile		54225.79
Standard Bootstrap		28444.24			
Bootstrap t		37125.31	MVU Estimate of Median		20633.09
Chebyshev (Mean, Std)		38796.93	MVU Estimate of Mean		22450.74
			MVU Estimate of Std. Dev.		9398.337
			MVU Estimate of SE of Mean		2830.895
			UCL Assuming Lognormal Distribution		
			95% H-UCL		29650.4
			95% Chebyshev (MVUE) UCL		34790.32
			99% Chebyshev (MVUE) UCL		50617.79
			Recommended UCL to use:		
			Student's t or H-UCL		

General Statistics

From File			
Summary Statistics for	lead s		
Number of Samples	11		
Minimum	5.9		
Maximum	852		
Mean	296.6727		
Median	136		
Standard Deviation	303.2947		
Variance	91987.66		
Coefficient of Variation	1.022321		
Skewness	0.794683		
Shapiro-Wilk Test Statistic	0.86788		
Shapiro-Wilk 5% Critical Value	0.85		
Data Are Normal at 0.05 Significance Level			
Recommended UCL to use	Student's t		
95 % UCL (Normal Data)			
Student's t	462.4165		
95 % UCL (Adjusted for Skewness)			
Adjusted CLT	470.5017		
Modified t	466.0683		
95 % Non-parametric UCL			
CLT	447.0893		
Jackknife	462.4165		
Standard Bootstrap	443.228		
Bootstrap t	505.4839		
Chebyshev (Mean, Std)	695.28		

General Statistics

From File				
Summary Statistics for			lead subs	
Number of Samples			8	
Minimum			1.3	
Maximum			2860	
Mean			688.75	
Median			7.95	
Standard Deviation			1267.686	
Variance			1607029	
Coefficient of Variation			1.840561	
Skewness			1.451184	
Shapiro-Wilk Test Statistic			0.582436	
Shapiro-Wilk 5% Critical Value			0.818	
Data Not Normal at 0.05 Significance Level				
Try Lognormal or Non-parametric UCL				
95% UCL (Normal Data)				
Student's t			1537.89	
95% UCL (Adjusted for Skewness)				
Adjusted CLT			1671.676	
Modified t			1576.216	
95% Non-parametric UCL				
CLT			1425.965	
Jackknife			1537.89	
Standard Bootstrap			1374.899	
Bootstrap t			263580.2	
Chebyshev (Mean, Std)			2642.386	

General Statistics

From File			
Summary Statistics for		MN S	
Number of Samples		11	
Minimum		50.4	
Maximum		1260	
Mean		421.0364	
Median		337	
Standard Deviation		361.4517	
Variance		130647.3	
Coefficient of Variation		0.858481	
Skewness		1.384176	
Shapiro-Wilk Test Statistic		0.86221	
Shapiro-Wilk 5% Critical Value		0.85	
Data Are Normal at 0.05 Significance Level			
Recommended UCL to use		Student's t	
95% UCL (Normal Data)			
Student's t		618.5616	
95% UCL (Adjusted for Skewness)			
Adjusted CLT		648.8947	
Modified t		626.1421	
95% Non-parametric UCL			
CLT		600.2955	
Jackknife		618.5616	
Standard Bootstrap		592.7033	
Bootstrap t		730.3619	
Chebyshev (Mean, Std)		896.077	

General Statistics

From File				
Summary Statistics for		Thallium s		
Number of Samples		11		
Minimum		1.25		
Maximum		15.6		
Mean		3.027273		
Median		1.25		
Standard Deviation		4.307457		
Variance		18.55418		
Coefficient of Variation		1.422884		
Skewness		2.975528		
Shapiro-Wilk Test Statistic		0.492114		
Shapiro-Wilk 5% Critical Value		0.85		
Data Not Normal at 0.05 Significance Level				
Try Lognormal or Non-parametric UCL				
95 % UCL (Normal Data)				
Student's t		5.381201		
95 % UCL (Adjusted for Skewness)				
Adjusted CLT		6.408531		
Modified t		5.575397		
95 % Non-parametric UCL				
CLT		5.163521		
Jackknife		5.381201		
Standard Bootstrap		5.055422		
Bootstrap t		14.7493		
Chebyshev (Mean, Std)		8.68838		

General Statistics

From File						
Summary Statistics for		Thallium s		Summary Statistics for		ln(Thallium
Number of Samples		11		Minimum		0.223144
Minimum		1.25		Maximum		2.747271
Maximum		15.6		Mean		0.654513
Mean		3.027273		Standard Deviation		0.827571
Median		1.25		Variance		0.684874
Standard Deviation		4.307457				
Variance		18.55418		Shapiro-Wilk Test Statistic		0.614116
Coefficient of Variation		1.422884		Shapiro-Wilk 5% Critical Value		0.85
Skewness		2.975528		Data Not Lognormal at 5% Significance Level		
				Try Normal or Non-parametric UCL		
95% UCL (Normal Data)						
Student's t		5.381201		Estimates Assuming Lognormal Distribution		
				MLE Mean		2.710005
95% UCL (Adjusted for Skewness)				MLE Standard Deviation		2.687586
Adjusted CLT		6.408531		MLE Coefficient of Variation		0.991727
Modified t		5.575397		MLE Skewness		3.950568
				MLE Median		1.924206
95% Non-parametric UCL				MLE 80% Quantile		3.872155
CLT		5.163521		MLE 90% Quantile		5.573051
Jackknife		5.381201		MLE 95% Quantile		7.507244
Standard Bootstrap		5.08725		MLE 99% Quantile		13.18981
Bootstrap t		14.7493				
Chebyshev (Mean, Std)		8.68838		MVU Estimate of Median		1.865075
				MVU Estimate of Mean		2.606972
				MVU Estimate of Std. Dev.		2.289399
				MVU Estimate of SE of Mean		0.681123
				UCL Assuming Lognormal Distribution		
				95% H-UCL		5.476628
				95% Chebyshev (MVUE) UCL		5.575918
				99% Chebyshev (MVUE) UCL		9.38406
				Recommended UCL to use:		
				H-UCL		

General Statistics

From File				
Summary Statistics for		Vanadium		
Number of Samples		11		
Minimum		20.6		
Maximum		41.6		
Mean		29.61818		
Median		29.2		
Standard Deviation		7.254491		
Variance		52.62764		
Coefficient of Variation		0.244934		
Skewness		0.511012		
Shapiro-Wilk Test Statistic		0.920537		
Shapiro-Wilk 5% Critical Value		0.85		
Data Are Normal at 0.05 Significance Level				
Recommended UCL to use		Student's t		
95 % UCL (Normal Data)				
Student's t		33.5826		
95 % UCL (Adjusted for Skewness)				
Adjusted CLT		33.57609		
Modified t		33.63877		
95 % Non-parametric UCL				
CLT		33.21599		
Jackknife		33.5826		
Standard Bootstrap		33.01587		
Bootstrap t		34.04377		
Chebyshev (Mean, Std)		39.15245		

General Statistics

From File			
Summary Statistics for		Zinc s	
Number of Samples		11	
Minimum		20.2	
Maximum		4560	
Mean		812.6818	
Median		552	
Standard Deviation		1323.079	
Variance		1750539	
Coefficient of Variation		1.628041	
Skewness		2.683676	
Shapiro-Wilk Test Statistic		0.624601	
Shapiro-Wilk 5% Critical Value		0.85	
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t		1535.715	
95 % UCL (Adjusted for Skewness)			
Adjusted CLT		1813.761	
Modified t		1589.514	
95 % Non-parametric UCL			
CLT		1468.852	
Jackknife		1535.715	
Standard Bootstrap		1439.362	
Bootstrap t		2983.985	
Chebyshev (Mean, Std)		2551.549	

General Statistics

From File						
Summary Statistics for		Zinc s		Summary Statistics for		ln(Zinc s)
Number of Samples		11		Minimum		3.005683
Minimum		20.2		Maximum		8.425078
Maximum		4560		Mean		5.550487
Mean		812.6818		Standard Deviation		1.763289
Median		552		Variance		3.109189
Standard Deviation		1323.079				
Variance		1750539		Shapiro-Wilk Test Statistic		0.936228
Coefficient of Variation		1.628041		Shapiro-Wilk 5% Critical Value		0.85
Skewness		2.683676		Data Are Lognormal at 5% Significance Level		
95% UCL (Normal Data)				Estimates Assuming Lognormal Distribution		
Student's t		1535.715		MLE Mean		1218.142
				MLE Standard Deviation		5635.518
95% UCL (Adjusted for Skewness)				MLE Coefficient of Variation		4.626324
Adjusted CLT		1813.761		MLE Skewness		112.8956
Modified t		1589.514		MLE Median		257.3629
				MLE 80% Quantile		1141.92
95% Non-parametric UCL				MLE 90% Quantile		2480.744
CLT		1468.852		MLE 95% Quantile		4680.209
Jackknife		1535.715		MLE 99% Quantile		15551.28
Standard Bootstrap		1447.427				
Bootstrap t		3179.442		MVU Estimate of Median		223.062
Chebyshev (Mean, Std)		2551.549		MVU Estimate of Mean		926.0761
				MVU Estimate of Std. Dev.		2026.062
				MVU Estimate of SE of Mean		527.1613
				UCL Assuming Lognormal Distribution		
				95% H-UCL		16179.6
				95% Chebyshev (MVUE) UCL		3223.919
				99% Chebyshev (MVUE) UCL		6171.265
				Recommended UCL to use:		
				99 % Chebyshev (MVUE) UCL		

General Statistics

From File			
Summary Statistics for	2 amino 46		
Number of Samples	11		
Minimum	0.025		
Maximum	16		
Mean	1.687636		
Median	0.045		
Standard Deviation	4.760715		
Variance	22.66441		
Coefficient of Variation	2.820936		
Skewness	3.282144		
Shapiro-Wilk Test Statistic	0.400695		
Shapiro-Wilk 5% Critical Value	0.85		
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t	4.28926		
95 % UCL (Adjusted for Skewness)			
Adjusted CLT	5.566485		
Modified t	4.526008		
95 % Non-parametric UCL			
CLT	4.048675		
Jackknife	4.28926		
Standard Bootstrap	3.987889		
Bootstrap t	38.48804		
Chebyshev (Mean, Std)	7.944442		

General Statistics

From File						
Summary Statistics for	2 amino 46		Summary Statistics for	ln(2 amino		
Number of Samples	14		Minimum	-3.688879		
Minimum	0.025		Maximum	2.772589		
Maximum	16		Mean	-1.959726		
Mean	1.687636		Standard Deviation	2.131348		
Median	0.045		Variance	4.542645		
Standard Deviation	4.760715					
Variance	22.66441		Shapiro-Wilk Test Statistic	0.821789		
Coefficient of Variation	2.820936		Shapiro-Wilk 5% Critical Value	0.85		
Skewness	3.282144		Data Not Lognormal at 5% Significance Level			
			Try Normal or Non-parametric UCL			
95 % UCL (Normal Data)						
Student's t	4.28926		Estimates Assuming Lognormal Distribution			
			MLE Mean	1.365604		
95 % UCL (Adjusted for Skewness)			MLE Standard Deviation	13.16508		
Adjusted CLT	5.566485		MLE Coefficient of Variation	9.640485		
Modified t	4.526008		MLE Skewness	924.8979		
			MLE Median	0.140897		
95 % Non-parametric UCL			MLE 80% Quantile	0.853221		
CLT	4.048675		MLE 90% Quantile	2.179416		
Jackknife	4.28926		MLE 95% Quantile	4.694267		
Standard Bootstrap	3.939011		MLE 99% Quantile	20.0412		
Bootstrap t	34.27236					
Chebyshev (Mean, Std)	7.944442		MVU Estimate of Median	0.114188		
			MVU Estimate of Mean	0.855795		
			MVU Estimate of Std. Dev.	2.429557		
			MVU Estimate of SE of Mean	0.57503		
			UCL Assuming Lognormal Distribution			
			95% H-UCL	54.94755		
			95% Chebyshev (MVUE) UCL	3.362292		
			99% Chebyshev (MVUE) UCL	6.57727		
			Recommended UCL to use:			
				99 % Chebyshev (MVUE) UCL		

General Statistics

From File			
Summary Statistics for	4amino26		
Number of Samples	11		
Minimum	0.025		
Maximum	9		
Mean	1.004727		
Median	0.062		
Standard Deviation	2.671638		
Variance	7.137649		
Coefficient of Variation	2.659068		
Skewness	3.230219		
Shapiro-Wilk Test Statistic	0.425564		
Shapiro-Wilk 5% Critical Value	0.85		
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t	2.464718		
95 % UCL (Adjusted for Skewness)			
Adjusted CLT	3.168001		
Modified t	2.595475		
95 % Non-parametric UCL			
CLT	2.329705		
Jackknife	2.464718		
Standard Bootstrap	2.242894		
Bootstrap t	12.50354		
Chebyshev (Mean, Std)	4.515947		

General Statistics

From File					
Summary Statistics for	4amino26L		Summary Statistics for	ln(4amino2	
Number of Samples	11		Minimum	-3.688879	
Minimum	0.025		Maximum	2.197225	
Maximum	9		Mean	-2.212719	
Mean	1.004727		Standard Deviation	1.981562	
Median	0.062		Variance	3.92659	
Standard Deviation	2.671638				
Variance	7.137649		Shapiro-Wilk Test Statistic	0.783007	
Coefficient of Variation	2.659068		Shapiro-Wilk 5% Critical Value	0.85	
Skewness	3.230219		Data Not Lognormal at 5% Significance Level		
			Try Normal or Non-parametric UCL		
95% UCL (Normal Data)					
Student's t	2.464718		Estimates Assuming Lognormal Distribution		
			MLE Mean	0.77925	
95% UCL (Adjusted for Skewness)			MLE Standard Deviation	5.495432	
Adjusted CLT	3.168001		MLE Coefficient of Variation	7.052211	
Modified t	2.595475		MLE Skewness	371.889	
			MLE Median	0.109403	
95% Non-parametric UCL			MLE 80% Quantile	0.583741	
CLT	2.329705		MLE 90% Quantile	1.395969	
Jackknife	2.464718		MLE 95% Quantile	2.848952	
Standard Bootstrap	2.284759		MLE 99% Quantile	10.98351	
Bootstrap t	12.50261				
Chebyshev (Mean, Std)	4.515947		MVU Estimate of Median	0.091269	
			MVU Estimate of Mean	0.532781	
			MVU Estimate of Std. Dev.	1.365825	
			MVU Estimate of SE of Mean	0.336766	
			UCL Assuming Lognormal Distribution		
			95% H-UCL	19.4766	
			95% Chebyshev (MVUE) UCL	2.000712	
			99% Chebyshev (MVUE) UCL	3.883565	
			Recommended UCL to use:		
			99 % Chebyshev (MVUE) UCL		

General Statistics

From File			
Summary Statistics for	246TNT		
Number of Samples	11		
Minimum	0.017		
Maximum	1300		
Mean	135.9578		
Median	0.0593		
Standard Deviation	390.3259		
Variance	152354.3		
Coefficient of Variation	2.870935		
Skewness	3.195983		
Shapiro-Wilk Test Statistic	0.412195		
Shapiro-Wilk 5% Critical Value	0.85		
Data Not Normal at 0.05 Significance Level			
Try Lognormal or Non-parametric UCL			
95 % UCL (Normal Data)			
Student's t	349.2621		
95 % UCL (Adjusted for Skewness)			
Adjusted CLT	450.7136		
Modified t	368.1632		
95 % Non-parametric UCL			
CLT	329.5368		
Jackknife	349.2621		
Standard Bootstrap	315.2		
Bootstrap t	61303.17		
Chebyshev (Mean, Std)	648.9465		

General Statistics

From File					
Summary Statistics for	246TNT		Summary Statistics for	ln(246TNT	
Number of Samples	11		Minimum	-4.074542	
Minimum	0.017		Maximum	7.17012	
Maximum	1300		Mean	-1.020704	
Mean	135.9578		Standard Deviation	3.893719	
Median	0.0593		Variance	15.16105	
Standard Deviation	390.3259				
Variance	152354.3		Shapiro-Wilk Test Statistic	0.761791	
Coefficient of Variation	2.870935		Shapiro-Wilk 5% Critical Value	0.85	
Skewness	3.195983		Data Not Lognormal at 5% Significance Level		
			Try Normal or Non-parametric UCL		
95% UCL (Normal Data)					
Student's t	349.2621		Estimates Assuming Lognormal Distribution		
			MLE Mean	706.1454	
95% UCL (Adjusted for Skewness)			MLE Standard Deviation	1383804	
Adjusted CLT	450.7136		MLE Coefficient of Variation	1959.658	
Modified t	368.1632		MLE Skewness	7.5E+009	
			MLE Median	0.360341	
95% Non-parametric UCL			MLE 80% Quantile	9.674452	
CLT	329.5368		MLE 90% Quantile	53.66307	
Jackknife	349.2621		MLE 95% Quantile	217.9933	
Standard Bootstrap	322.6776		MLE 99% Quantile	3090.497	
Bootstrap t	61370.2				
Chebyshev (Mean, Std)	648.9465		MVU Estimate of Median	0.172789	
			MVU Estimate of Mean	53.16936	
			MVU Estimate of Std. Dev.	388.2783	
			MVU Estimate of SE of Mean	49.8954	
			UCL Assuming Lognormal Distribution		
			95% H-UCL	1E+008	
			95% Chebyshev (MVUE) UCL	270.6584	
			99% Chebyshev (MVUE) UCL	549.6223	
			Recommended UCL to use:		
			Needs further investigation.		

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
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65554-2

ALUMINUM

Soil

S

S9	17800.0000	MG/KG
S3	12900.0000	MG/KG
S10	19800.0000	MG/KG
S11	18600.0000	mg/kg
S12	9540.0000	MG/KG
S5	11800.0000	MG/KG
S6	12100.0000	MG/KG
S7	13100.0000	MG/KG
S2	16500.0000	MG/KG
S8	11800.0000	MG/KG
S1	10700.0000	MG/KG

SS

SS11	15100.0000	MG/KG
SS12	32000.0000	MG/KG
SS5	16300.0000	MG/KG
SS6	4400.0000	MG/KG
SS7	17800.0000	MG/KG

<i>PCAcodes</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	989.0000		MG/KG
				SS9	1050.0000		MG/KG
				SS10	17100.0000		mg/kg

ANALYTE MAX REPORT

PCAcod	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
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65554-2

ANTIMONY

Soil

S

S9	0.3600	B	MG/KG
S3	1.7000	B	MG/KG
S10	0.9400	B	MG/KG
S11	1.9000	B	mg/kg
S12	2.4000	J	MG/KG
S5	2.9000	J	MG/KG
S6	0.2500	B	MG/KG
S7	1.3000	B	MG/KG
S2	9.4000	L	MG/KG
S8	0.4400	B	MG/KG
S1	1.9000	B	MG/KG

SS

SS11	0.5100	B	MG/KG
SS12	12.6000	L	MG/KG
SS5	17.1000	L	MG/KG
SS6	0.3000	B	MG/KG
SS7	0.3200	B	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	0.2200	B	MG/KG
				SS9	0.2200	B	MG/KG
				SS10	3.0000	UL	mg/kg

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2							
	BARIUM						
		Soil					
			S				
				S9	52.9000	J	MG/KG
				S3	570.0000	J	MG/KG
				S10	709.0000	J	MG/KG
				S11	992.0000	J	mg/kg
				S12	377.0000	J	MG/KG
				S5	717.0000	J	MG/KG
				S6	97.2000	J	MG/KG
				S7	576.0000	J	MG/KG
				S2	1960.0000	J	MG/KG
				S8	26.4000	J	MG/KG
				S1	611.0000	J	MG/KG
			SS				
				SS11	53.0000	J	MG/KG
				SS12	1970.0000	J	MG/KG
				SS5	2780.0000	J+	MG/KG
				SS6	11.3000	J	MG/KG
				SS7	53.1000	J	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	3.3000	J	MG/KG
				SS9	3.2000	J	MG/KG
				SS10	52.0000	J	mg/kg

ANALYTE MAX REPORT

PCACode	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
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65554-2

CADMIUM

Soil

S

S9	0.2500	UJ	MG/KG
S3	6.5000		MG/KG
S10	0.3600	J	MG/KG
S11	0.2700	J	mg/kg
S12	2.8000	J	MG/KG
S5	5.0000	J	MG/KG
S6	0.2500	UJ	MG/KG
S7	2.4000	J	MG/KG
S2	13.6000		MG/KG
S8	0.2500	UJ	MG/KG
S1	5.7000		MG/KG

SS

SS11	0.2500	UJ	MG/KG
SS12	49.3000	J	MG/KG
SS5	64.6000	J	MG/KG
SS6	0.2500	UJ	MG/KG
SS7	0.2500	UJ	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	0.2500	UJ	MG/KG
				SS9	0.2500	UJ	MG/KG
				SS10	0.2500	UJ	mg/kg

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
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65554-2

CHROMIUM

Soil

S

S9	28.4000	J	MG/KG
S3	30.6000	L	MG/KG
S10	29.1000	J	MG/KG
S11	29.0000	J	mg/kg
S12	73.9000	J	MG/KG
S5	155.0000	J	MG/KG
S6	15.0000	J	MG/KG
S7	18.7000	J	MG/KG
S2	289.0000	L	MG/KG
S8	21.6000	J	MG/KG
S1	50.8000	L	MG/KG

SS

SS11	25.1000	J	MG/KG
SS12	170.0000	J	MG/KG
SS5	206.0000	J	MG/KG
SS6	12.1000	J	MG/KG
SS7	24.8000	J	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	11.3000	J	MG/KG
				SS9	14.6000	J	MG/KG
				SS10	23.7000	J	mg/kg

ANALYTE MAX REPORT

PCACode	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
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65554-2

COPPER

Soil

S

S9	11.4000	L	MG/KG
S3	319.0000	J	MG/KG
S10	120.0000	L	MG/KG
S11	60.2000	L	mg/kg
S12	223.0000	L	MG/KG
S5	137.0000	L	MG/KG
S6	6.2000	L	MG/KG
S7	59.6000	L	MG/KG
S2	10200.0000	J+	MG/KG
S8	7.8000	L	MG/KG
S1	407.0000	J	MG/KG

SS

SS11	11.9000	L	MG/KG
SS12	871.0000	L	MG/KG
SS5	2810.0000	L	MG/KG
SS6	5.4000	L	MG/KG
SS7	12.6000	L	MG/KG

Monday, April 11, 2005

Page 1 of 2

<i>PCAcodes</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	3.3000	L	MG/KG
				SS9	3.9000	L	MG/KG
				SS10	13.3000	L	mg/kg

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2	IRON	Soil					
			S				
				S9	24600.0000	J	MG/KG
				S3	16000.0000		MG/KG
				S10	24400.0000	J	MG/KG
				S11	24600.0000	J	mg/kg
				S12	19700.0000	J	MG/KG
				S5	20000.0000	J	MG/KG
				S6	12000.0000	J	MG/KG
				S7	13300.0000	J	MG/KG
				S2	57200.0000		MG/KG
				S8	18300.0000	J	MG/KG
				S1	20200.0000		MG/KG
			SS				
				SS11	23400.0000	J	MG/KG
				SS12	80800.0000	J+	MG/KG
				SS5	73400.0000	J+	MG/KG
				SS6	9520.0000	J	MG/KG
				SS7	21700.0000	J	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	5170.0000	J	MG/KG
				SS9	7850.0000	J	MG/KG
				SS10	21900.0000	J	mg/kg

ANALYTE MAX REPORT

PCACode	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2	LEAD						
		Soil					
			S				
				S9	11.2000	J	MG/KG
				S3	295.0000	J	MG/KG
				S10	136.0000	J	MG/KG
				S11	122.0000	J	mg/kg
				S12	541.0000	J	MG/KG
				S5	459.0000	J	MG/KG
				S6	10.3000	J	MG/KG
				S7	105.0000	J	MG/KG
				S2	852.0000	J	MG/KG
				S8	5.9000	J	MG/KG
				S1	726.0000	J	MG/KG
			SS				
				SS11	7.9000	J	MG/KG
				SS12	2620.0000	J	MG/KG
				SS5	2860.0000	J	MG/KG
				SS6	2.8000	J	MG/KG
				SS7	8.7000	J	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	1.3000	J	MG/KG
				SS9	1.3000	J	MG/KG
				SS10	8.0000	J	mg/kg

ANALYTE MAX REPORT

PCAcode	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2							
	MANGANESE						
		Soil					
			S				
				S9	121.0000	J	MG/KG
				S3	742.0000	J	MG/KG
				S10	182.0000	J	MG/KG
				S11	167.0000	J	mg/kg
				S12	381.0000	J	MG/KG
				S5	453.0000	J	MG/KG
				S6	208.0000	J	MG/KG
				S7	337.0000	J	MG/KG
				S2	1260.0000	J	MG/KG
				S8	50.4000	J	MG/KG
				S1	730.0000	J	MG/KG
			SS				
				SS11	107.0000	J	MG/KG
				SS12	1740.0000	J	MG/KG
				SS5	1720.0000	J	MG/KG
				SS6	54.4000	J	MG/KG
				SS7	132.0000	J	MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	65.9000	J	MG/KG
				SS9	54.4000	J	MG/KG
				SS10	166.0000	J	mg/kg

ANALYTE MAX REPORT

PCAcodes	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2	THALLIUM						
		Soil					
			S				
				S9	1.2500	UL	MG/KG
				S1	4.5000		MG/KG
				S10	1.2500	UL	MG/KG
				S11	1.2500	UL	mg/kg
				S12	1.2500	UL	MG/KG
				S5	1.2500	UL	MG/KG
				S6	1.2500	UL	MG/KG
				S7	1.2500	UL	MG/KG
				S2	15.6000		MG/KG
				S8	1.2500	UL	MG/KG
				S3	3.2000		MG/KG
			SS				
				SS11	1.2500	UL	MG/KG
				SS12	1.3000	J	MG/KG
				SS5	1.7000	J	MG/KG
				SS6	1.2500	UL	MG/KG
				SS7	1.2500	UL	MG/KG

<i>PCAcodes</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	1.2500	UL	MG/KG
				SS9	1.2500	UL	MG/KG
				SS10	1.2500	UL	mg/kg

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2							
	VANADIUM						
		Soil					
			S				
				S9	39.5000		MG/KG
				S1	27.2000		MG/KG
				S10	41.6000		MG/KG
				S11	37.8000		mg/kg
				S12	24.2000		MG/KG
				S5	29.5000		MG/KG
				S6	20.6000		MG/KG
				S7	21.5000		MG/KG
				S2	30.9000		MG/KG
				S8	29.2000		MG/KG
				S3	23.8000		MG/KG
			SS				
				SS11	39.0000		MG/KG
				SS12	26.9000		MG/KG
				SS5	28.5000		MG/KG
				SS6	14.6000		MG/KG
				SS7	41.2000		MG/KG

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	6.9000		MG/KG
				SS9	10.6000		MG/KG
				SS10	41.0000		mg/kg

ANALYTE MAX REPORT

PCACode	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2							
	ZINC						
		Soil					
			S				
				S9	32.1000		MG/KG
				S1	568.0000		MG/KG
				S10	144.0000		MG/KG
				S11	110.0000		mg/kg
				S12	552.0000		MG/KG
				S5	657.0000		MG/KG
				S6	30.2000		MG/KG
				S7	1530.0000		MG/KG
				S2	4560.0000	+	MG/KG
				S8	20.2000		MG/KG
				S3	736.0000		MG/KG
			SS				
				SS11	27.6000		MG/KG
				SS12	4050.0000	+	MG/KG
				SS5	4280.0000	+	MG/KG
				SS6	19.9000		MG/KG
				SS7	36.1000		MG/KG

<i>PCAcodes</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	4.4000	B	MG/KG
				SS9	5.2000	B	MG/KG
				SS10	34.2000		mg/kg

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2	2-AMINO-4,6-DINITROTOLUENE	Soil					
			S				
				S9	0.0250	U	mg/kg
				S3	0.1050		mg/kg
				S10	0.0250	U	MG/KG
				S11	0.0250	U	mg/kg
				S12	0.7140		mg/kg
				S5	1.1200		mg/kg
				S6	0.4380		mg/kg
				S7	16.0000	J	mg/kg
				S2	0.0450		mg/kg
				S8	0.0250	U	mg/kg
				S1	0.0420		mg/kg
			SS				
				SS11	0.0250	U	mg/kg
				SS12	6.3500		mg/kg
				SS5	8.0400		mg/kg
				SS6	0.0547		mg/kg
				SS7	0.8460		mg/kg

<i>PCAcodes</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	0.0250	U	mg/kg
				SS9	0.0250	U	mg/kg
				SS10	0.0250	U	mg/kg

ANALYTE MAX REPORT

PCAcide	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2	4-AMINO-2,6-DINITROTOLUENE						
		Soil					
			S				
				S9	0.0250	U	mg/kg
				S3	0.1080		mg/kg
				S10	0.0250	U	mg/kg
				S11	0.0250	U	mg/kg
				S12	0.7310		mg/kg
				S5	0.9610		mg/kg
				S6	0.0250	U	mg/kg
				S7	9.0000	J	mg/kg
				S2	0.0620		mg/kg
				S8	0.0250	U	mg/kg
				S1	0.0650		mg/kg
			SS				
				SS11	0.0500	U	mg/kg
				SS12	4.8600		mg/kg
				SS5	7.0800		mg/kg
				SS6	0.0250	U	mg/kg
				SS7	0.3800		mg/kg

<i>PCAcode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	0.0250	U	mg/kg
				SS9	0.0250	U	mg/kg
				SS10	0.0250	U	mg/kg

ANALYTE MAX REPORT

PCACode	Analyte	Matrix	Depth	SampleID	Concentration	Qualifier	ConcUnit
65554-2	2,4,6-TRINITROTOLUENE	Soil					
			S				
				S9	0.0250	U	mg/kg
				S3	0.3450		mg/kg
				S10	0.0250	U	mg/kg
				S11	0.0250	U	mg/kg
				S12	192.0000		mg/kg
				S5	2.9200		mg/kg
				S6	0.0593		mg/kg
				S7	1300.0000		mg/kg
				S2	0.0170	J	mg/kg
				S8	0.0730		mg/kg
				S1	0.0460		mg/kg
			SS				
				SS11	0.0250	U	mg/kg
				SS12	3.8400		mg/kg
				SS5	10.1000		mg/kg
				SS6	0.3580		mg/kg
				SS7	30.5000		mg/kg

<i>PCACode</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	0.0250	U	mg/kg
				SS9	0.0250	U	mg/kg
				SS10	0.0483		mg/kg

ANALYTE MAX REPORT

<i>PCAcide</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
65554-2							
	ARSENIC						
		Soil					
			S				
				S9	5.0000	J	MG/KG
				S3	4.5000		MG/KG
				S10	4.4000	J	MG/KG
				S11	4.7000	J	mg/kg
				S12	3.3000	J	MG/KG
				S5	4.4000	J	MG/KG
				S6	3.0000	J	MG/KG
				S7	3.5000	J	MG/KG
				S2	9.5000		MG/KG
				S8	3.4000	J	MG/KG
				S1	5.5000		MG/KG
			SS				
				SS11	4.0000	J	MG/KG
				SS12	16.4000	J	MG/KG
				SS5	22.4000	J	MG/KG
				SS6	1.2000	J	MG/KG
				SS7	4.3000	J	MG/KG

<i>PCAcod</i>	<i>Analyte</i>	<i>Matrix</i>	<i>Depth</i>	<i>SampleID</i>	<i>Concentration</i>	<i>Qualifier</i>	<i>ConcUnit</i>
				SS8	0.3600	J	MG/KG
				SS9	0.8500	J	MG/KG
				SS10	3.7000	J	mg/kg

ATTACHMENT B

DATA ENTRY SHEET

SL-SCREEN
Version 3.0; 04/0Reset to
Defaults

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R ($\mu\text{g}/\text{kg}$)	Chemical
71432	7.00E+00	Benzene

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_f (15 or 200 cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Average soil temperature, T_s ($^{\circ}\text{C}$)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	200	13.9	SICL		

MORE
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Vadose zone soil organic carbon fraction, f_{oc}^V (unitless)
SICL	1.5	0.43	0.3	0.002

ENTER
Average vapor
flow rate into bldg.
(Leave blank to calculate) Q_{soil}
(L/m)

5

MORE
↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

END

Used to calculate risk-based
soil concentration.

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C _{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	5.90E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.8E-05	NA

MESSAGE SUMMARY BELOW:

END

DATA ENTRY SHEET

SL-SCREEN
Version 3.0; 04/0Reset to
Defaults

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R ($\mu\text{g}/\text{kg}$)	Chemical
79016	1.40E+02	Trichloroethylene

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (15 or 200 cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Average soil temperature, T_s ($^{\circ}\text{C}$)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	200	13.9	SICL		

MORE
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Vadose zone soil organic carbon fraction, f_{oc}^V (unitless)
SICL	1.5	0.43	0.3	0.002

ENTER
Average vapor
flow rate into bldg.
(Leave blank to calculate) Q_{soil}
(L/m)

5

MORE
↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

END

Used to calculate risk-based
soil concentration.

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C _{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	8.15E+05	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.6E-03	4.5E+00

MESSAGE SUMMARY BELOW:

MESSAGE: Risk/HQ or risk-based soil concentration is based on a route-to-route extrapolation.

END

DATA ENTRY SHEET

SL-SCREEN
version 3.0; 04/0Reset to
Defaults

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R ($\mu\text{g/kg}$)	Chemical
7439976	4.10E+02	Mercury (elemental)

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_f (15 or 200 cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Average soil temperature, T_s ($^{\circ}\text{C}$)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
15	15	13.9	SICL		

MORE
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b (g/cm^3)	ENTER Vadose zone soil total porosity, n^v (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^v (cm^3/cm^3)	ENTER Vadose zone soil organic carbon fraction, f_{oc}^v (unitless)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SICL	1.5	0.43	0.3	0.002	5

MORE
↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

END

Used to calculate risk-based
soil concentration.

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C _{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	1.04E+06	NA

MESSAGE SUMMARY BELOW:

END

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	2.4E+03

DATA ENTRY SHEET

SL-SCREEN
Version 3.0; 04/0Reset to
Defaults

CALCULATE RISK-BASED SOIL CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL SOIL CONCENTRATION (enter "X" in "YES" box and initial soil conc. below)

YES

X

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial soil conc., C_R ($\mu\text{g/kg}$)	Chemical
7439976	3.30E+02	Mercury (elemental)

MORE
↓

ENTER Depth below grade to bottom of enclosed space floor, L_f (15 or 200 cm)	ENTER Depth below grade to top of contamination, L_t (cm)	ENTER Average soil temperature, T_s ($^{\circ}\text{C}$)	ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vadose zone soil vapor permeability, k_v (cm^2)
200	200	13.9	SICL		

MORE
↓

ENTER Vadose zone SCS soil type Lookup Soil Parameters	ENTER Vadose zone soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)	ENTER Vadose zone soil organic carbon fraction, f_{oc}^V (unitless)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
SICL	1.5	0.43	0.3	0.002	5

MORE
↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	30	30	350	1.0E-06	1

END

Used to calculate risk-based
soil concentration.

RESULTS SHEET

RISK-BASED SOIL CONCENTRATION CALCULATIONS:

Indoor exposure soil conc., carcinogen (µg/kg)	Indoor exposure soil conc., noncarcinogen (µg/kg)	Risk-based indoor exposure soil conc., (µg/kg)	Soil saturation conc., C _{sat} (µg/kg)	Final indoor exposure soil conc., (µg/kg)
NA	NA	NA	1.04E+06	NA

MESSAGE SUMMARY BELOW:

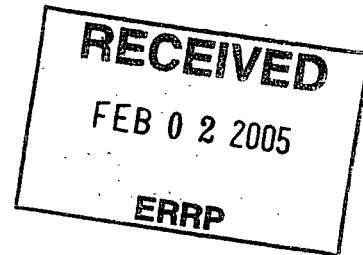
END

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	1.5E+03



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350



DATE : January 31, 2005
SUBJECT: Region III Data QA Review
FROM : Khin-Cho Thaung *KCT*
Region III ESAT RPO (3EA20)
TO : Lorie Baker
Regional Project Manager (3HS34)

Attached is the organic data validation report for the Elkton Farm site (Case #: 33696, ~~SDG# 0035~~ | ~~0036~~ completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

If you have any questions regarding this review, please call me at (410) 305-2743.

Attachments

cc: Peggy Smith (MDE)

TO File #: 0015

TDF#: 0172

ANALYTICAL SERVICES AND QUALITY ASSURANCE BRANCH



Printed on 100% recycled/recyclable paper with 100% post-consumer fiber and process chlorine free.
Customer Service Hotline: 1-800-438-2474

DATE: January 31, 2005

SUBJECT: Level M3 Organic Data Validation for Case 33696
SDG: C02J5, C02J6
Site: Elkton Farm

FROM: Shilpa Udani *su*
Organic Data Reviewer

Mahboobeh Mecanic *bm*
Senior Oversight Chemist

TO: Khin-Cho Thuang
ESAT Region 3 Project Officer

OVERVIEW

Case 33696, Sample Delivery Group (SDGs) C02J5 and C02J6, consisted of twelve (12) soil samples and one (1) associated aqueous trip blank submitted to EnviroSystems, Inc. (ENVSYS) for volatile analysis. The sample set included one (1) field duplicate pair. Samples were analyzed according to Contract Laboratory Program (CLP) Statement of Work (SOW) OLM04.3 through Routine Analytical Services (RAS) program.

SUMMARY

Data were validated according to Region III Modifications to the National Functional Guidelines for Organic Data Review, Level M3. All samples were successfully analyzed for all target compounds.

NOTES

- Acetone was detected at a concentration of 2 J ug/Kg, in the analyses of the storage blank (VHBLKFY) in SDG C02J5. Samples C02J5 and C02J9, which had concentrations of this common laboratory contaminant less than ten times (<10X) the blank concentration have been qualified "B" on the Data Summary Form (DSF).
- Several compounds failed precision criteria [Percent Relative Standard Deviation (%RSD) and/or Percent Difference (%D)] in the initial and/or continuing calibrations. No positive results were associated with these outliers. Imprecision did not exceed the 50% criteria, therefore, quantitation limits were not qualified.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) analyses of sample C02J5 (SDG C02J5) reported recoveries of trichloroethene outside the lower control limits in both analyses. Additionally, the Relative Percent Difference (RPD) for 1,1-dichloroethene was outside the Quality Control (QC) limit. No data were qualified based on MS/MSD recoveries.

Appendix A

Glossary of Data Qualifier Terms

Appendix B
Data Summery Forms

Page 1 of 8

Number of Soil Samples : 3

Number of Water Samples : 0

ENVSYS

Sample Number :	C02J5	C02J9	C02K0		
Sampling Location :	SS1	SS2	SS3		
Field QC:					
Matrix :	Soil	Soil	Soil		
Units :	ug/Kg	ug/Kg	ug/Kg		
Date Sampled :	12/14/2004	12/14/2004	12/14/2004		
Time Sampled :	12:30	15:30	16:05		
%Moisture :	17	27	20		
Dilution Factor :	0.93	0.81	0.98		
Volatile Compound	CRQL	Result	Flag	Result	Flag
Dichlorodifluoromethane	10				
Chloromethane	10				
Vinyl Chloride	10				
Bromomethane	10				
Chloroethane	10				
Trichlorofluoromethane	10				
1,1-Dichloroethene	10				
1,1,2-Trichloro-1,2,2-trifluoroethane	10				
Acetone	10	3	B	3	B
Carbon Disulfide	10				
Methyl Acetate	10				
Methylene Chloride	10				
trans-1,2-Dichloroethene	10				
tert-Butyl Methyl Ether	10				
1,1-Dichloroethane	10				
cis-1,2-Dichloroethene	10				
2-Butanone	10				
Chloroform	10				
1,1,1-Trichloroethane	10				
Cyclohexane	10				
Carbon Tetrachloride	10				
Benzene	10			7	J
1,2-Dichloroethane	10				
Trichloroethene	10	37		17	
Methylcyclohexane	10				
1,2-Dichloropropane	10				
Bromodichloromethane	10				
cis-1,3-Dichloropropene	10				
4-Methyl-2-pentanone	10				
Toluene	10				
trans-1,3-Dichloropropene	10				
1,1,2-Trichloroethane	10				
Tetrachloroethene	10				

DATA SUMMARY FORM: VOLATILES

Page 2 of 8

Case #: 33696

SDG : C02J5

Site :

ELKTON FARM

Lab. :

ENVSYS

Sample Number :	C02J5	C02J9	C02K0								
Sampling Location :	SS1	SS2	SS3								
Sampling Location :	SS1	SS2	SS3								
Field QC:											
Matrix :	Soil	Soil	Soil								
Units :	ug/Kg	ug/Kg	ug/Kg								
Date Sampled :	12/14/2004	12/14/2004	12/14/2004								
Time Sampled :	12:30	15:30	16:05								
%Moisture :	17	27	20								
Dilution Factor :	0.93	0.81	0.98								
Volatile Compound	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Hexanone	10										
Dibromochloromethane	10										
1,2-Dibromoethane	10										
Chlorobenzene	10										
Ethylbenzene	10										
Xylenes (total)	10										
Styrene	10										
Bromoform	10										
Isopropylbenzene	10										
1,1,2,2-Tetrachloroethane	10										
1,3-Dichlorobenzene	10										
1,4-Dichlorobenzene	10										
1,2-Dichlorobenzene	10										
1,2-Dibromo-3-chloropropane	10										
1,2,4-Trichlorobenzene	10										

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: $(CRQL * Dilution Factor) / (100 - \%Moisture) / 100$

Revised 09/99

Page 3 of 8

Number of Soil Samples : 9

Number of Water Samples : 1

ENVSYS

[illegible]

DATA SUMMARY FORM: VOLATILES

Page 4 of 8

Case #: 33696

SDG : C02J6

Site :

ELKTON FARM

Lab. :

ENVSYS

Sample Number :	C02J6	C02J7	C02J8	C02K1	C02K2
Sampling Location :	SS10	SS11	SS12	SS4	SS5
FieldQC:			Dup. of C02K2		Dup. of C02J8
Matrix :	Soil	Soil	Soil	Soil	Soil
Units :	ug/Kg	ug/Kg	ug/Kg	ug/Kg	ug/Kg
Date Sampled :	1/11/2005	1/11/2005	1/12/2005	1/12/2005	1/12/2005
Time Sampled :	10:00	11:45	11:30	12:40	11:15
%Moisture :	20	18	20	13	19
Dilution Factor :	0.89	0.91	1.02	0.81	0.88

Volatile Compound	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Hexanone	10										
Dibromochloromethane	10										
1,2-Dibromoethane	10										
Chlorobenzene	10										
Ethylbenzene	10										
Xylenes (total)	10										
Styrene	10										
Bromoform	10										
Isopropylbenzene	10										
1,1,2,2-Tetrachloroethane	10										
1,3-Dichlorobenzene	10										
1,4-Dichlorobenzene	10										
1,2-Dichlorobenzene	10										
1,2-Dibromo-3-chloropropane	10										
1,2,4-Trichlorobenzene	10										

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor) / (100 - %Moisture) / 100

Revised 09/99

Page 5 of 8

SDG : C02J6

ELKTON FARM

ENVSYS

[illegible]

DATA SUMMARY FORM: VOLATILES

Page 6 of 8

Case #: 33696

SDG : C02J6

Site :

ELKTON FARM

Lab. :

ENVSYS

Sample Number :	C02K3	C02K4	C02K5	C02K6							
Sampling Location :	SS6	SS7	SS8	SS9							
Field QC:											
Matrix :	Soil	Soil	Soil	Soil							
Units :	ug/Kg	ug/Kg	ug/Kg	ug/Kg							
Date Sampled :	1/11/2005	1/11/2005	1/12/2005	1/12/2005							
Time Sampled :	13:55	15:25	09:15	10:30							
%Moisture :	14	20	7	9							
Dilution Factor :	1.09	0.86	0.98	1.22							
Volatile Compound	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Hexanone	10										
Dibromochloromethane	10										
1,2-Dibromoethane	10										
Chlorobenzene	10										
Ethylbenzene	10										
Xylenes (total)	10										
Styrene	10										
Bromoform	10										
Isopropylbenzene	10										
1,1,2,2-Tetrachloroethane	10										
1,3-Dichlorobenzene	10										
1,4-Dichlorobenzene	10										
1,2-Dichlorobenzene	10										
1,2-Dibromo-3-chloropropane	10										
1,2,4-Trichlorobenzene	10										

CRQL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: $(CRQL * Dilution Factor) / (100 - \%Moisture) / 100$

Revised 09/99

DATA SUMMARY FORM: VOLATILES

Page 7 of 8

Case #: 33696

SDG : C02J6

Site :

ELKTON FARM

Lab. :

ENVSYS

[illegible]

DATA SUMMARY FORM: VOLATILES

Page 8 of 8

Case #: 33696

SDG : C02J6

Site :

ELKTON FARM

Lab. :

ENVSYS

Sample Number : C02K7
Sampling Location : S15
Field QC: Trip Blank
Matrix : Water
Units : ug/L
Date Sampled : 1/12/2005
Time Sampled : 11:45
pH : < 2
Dilution Factor : 1.0

Volatile Compound	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
2-Hexanone	10										
Dibromochloromethane	10										
1,2-Dibromoethane	10										
*Chlorobenzene	10										
*Ethylbenzene	10										
Xylenes (total)	10										
*Styrene	10										
Bromoform	10										
Isopropylbenzene	10										
1,1,2,2-Tetrachloroethane	10										
*1,3-Dichlorobenzene	10										
*1,4-Dichlorobenzene	10										
1,2-Dichlorobenzene	10										
1,2-Dibromo-3-chloropropane	10										
1,2,4-Trichlorobenzene	10										

CRQL = Contract Required Quantitation Limit

*Action Level Exists

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRQL * Dilution Factor)

Revised 09/99

Appendix C

Chain-of-custody Records



USEPA Contract Laboratory Program
Organic Traffic Report & Chain of Custody Record

Case No: 33696

DAS No: B32060

R

Region: 3	Date Shipped: 1/11/2005	Chain of Custody Record		Sampler Signature:
Project Code:	Carrier Name: FedEx	Relinquished By	(Date / Time)	Received By (Date / Time)
Account Code: 2004T03W302DD2C037ZLA00	Airbill: 850760667225	1		
CERCLIS ID: MDD985407186	Shipped to: EnviroSystems, Inc. 9200 Rumsey Rd. Suite B102 Columbia MD 21045 (410) 964-0330	2		
Spill ID:		3		
Site Name/State: ELKTON FARM FIREHOLE FUDS/MD		4		
Project Leader: Alex Cox				
Action: Expanded Site Investigation/RI				
Sampling Co: MDE-ERRP				

ORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	INORGANIC SAMPLE No.	QC Type
C02J6	Subsurface Soil (>12")/ Philip Anderson	L/G	% Moist (21), VOA (21)	2714 (Ice Only), 2716 (Ice Only), 2717 (Ice Only), 2718 (Ice Only) (4)	SS10	S: 1/11/2005 10:00	MC02J6	-
C02J7	Subsurface Soil (>12")/ Philip Anderson	L/G	% Moist (21), VOA (21)	2719 (Ice Only), 2721 (Ice Only), 2722 (Ice Only), 2723 (Ice Only) (4)	SS11	S: 1/11/2005 11:45	MC02J7	-
C02K3	Subsurface Soil (>12")/ Philip Anderson	L/G	% Moist (21), VOA (21)	2749 (Ice Only), 2751 (Ice Only), 2752 (Ice Only), 2753 (Ice Only) (4)	SS6	S: 1/11/2005 13:55	MC02K3	-
C02K4	Subsurface Soil (>12")/ Philip Anderson	L/G	% Moist (21), VOA (21)	2754 (Ice Only), 2756 (Ice Only), 2757 (Ice Only), 2758 (Ice Only) (4)	SS7	S: 1/11/2005 15:25	MC02K4	-

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key: % Moist = % Moisture, VOA = CLP VOCs (SOLIDS)	Concentration: L = Low, N = Low/Medium, H = High	Type/Designate: Composites = C, Grab = G	Shipment loaded? _____

TR Number: 3-592370820-011105-0002

REGION COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Sample for: State Management Office, Attn: Hannah Bauer, 15000 Conference Center Dr., Omaha, NE 68154-3000, Phone: (402) 441-8420, Fax: (402) 441-7030, E-mail: hbaue@state.gov

Jan-28-2005 09:47 am

From-MDE WAS ERPP

410 537 3472

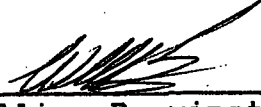
T-888 P.007/013 F-663

01/28/2005 FRI 09:42 [TX/RX NO 8831] 007

Appendix D

Laboratory Case Narrative

I CERTIFY THAT THIS DATA PACKAGE IS IN COMPLIANCE WITH THE TERMS AND CONDITIONS OF THE CONTRACT, BOTH TECHNICALLY AND FOR COMPLETENESS, FOR OTHER THAN THE CONDITIONS DETAILED ABOVE. RELEASE OF THE DATA CONTAINED IN THIS HARDCOPY DATA PACKAGE AND IN THE COMPUTER-READABLE DATA SUBMITTED ON DISKETTE HAS BEEN AUTHORIZED BY THE LABORATORY MANAGER OR HIS/HER DESIGNEE, AS VERIFIED BY THE FOLLOWING SIGNATURE:



William Brewington
Organics Section Manager


DATE: _____

1/8/05
6 January 2005

Each of the ten MS/MSD recoveries and each of the five MS/MSD RPD values were within the EPA advisory QC limits for water.

Manual integrations were performed on the following samples and/or standards due to poor peak shape, coelution and/or low response: VSTD010BY, VSTD020BY, VSTD010FZ, VSTD020FZ, VSTD050FZ, VSTD100FZ and VSTD200FZ.

I CERTIFY THAT THIS DATA PACKAGE IS IN COMPLIANCE WITH THE TERMS AND CONDITIONS OF THE CONTRACT, BOTH TECHNICALLY AND FOR COMPLETENESS, FOR OTHER THAN THE CONDITIONS DETAILED ABOVE. RELEASE OF THE DATA CONTAINED IN THIS HARDCOPY DATA PACKAGE AND IN THE COMPUTER-READABLE DATA SUBMITTED ON DISKETTE HAS BEEN AUTHORIZED BY THE LABORATORY MANAGER OR HIS/HER DESIGNEE, AS VERIFIED BY THE FOLLOWING SIGNATURE:



William Brewington
Organics Section Manager

DATE: 1/25/05
25 January 2005

**U.S. EPA REGION III
Analytical Services & Quality Assurance Branch
Fort Meade, Maryland**

**ASQAB LABORATORY REPORT
FINAL DATA**

ELKTON FARMS

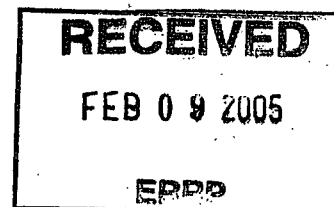
**Lab Request #: REQ05043
Request Form #: DAS R32050**

Report prepared on: February 7, 2005

Approval for release:


ASQAB Representative

Site contact(s): Lorie Baker (3HS34)
Alex Cox



U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 1 of 1

SITE NAME: ELKTON FARMS

LAB REQUEST # REQ05043

SAMPLE DESCRIPTIONS

<u>Sample #</u>	<u>Station</u>	<u>Description</u>	<u>Matrix</u>	<u>Type</u>	<u>End Collection</u>	
					<u>Date</u>	<u>Time</u>
04121501	S1	R31884-S1	Soil	GRAB	12/14/2004	12:30
04121502	S1-X	R31884-S1-X	Soil	GRAB	12/14/2004	12:30
04121503	S2	R31884-S2	Soil	GRAB	12/14/2004	15:30
04121504	S2-X	R31884-S2-X	Soil	GRAB	12/14/2004	15:30
04121505	S3	R31884-S3	Soil	GRAB	12/14/2004	16:10
04121506	S3-X	R31884-S3-X	Soil	GRAB	12/14/2004	16:10

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 1 of 1

SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05043

TESTS REQUESTED

INORGANICS

041215

	01	03	05
Percent Dry Weight	X	X	X
Perchlorate by IC	X	X	X

ORGANICS

041215

	02	04	06
Nitroaromatics and Nitramines by HPLC	X	X	X

(X = Test Requested)

USEPA Region III
Analytical Services & Quality Assurance Branch

Page 1 of 1

SITE NAME: ELKTON FARMS
LAB REQUEST #: REQ05043

QUALIFIER CODE AND GLOSSARY DEFINITIONS

Qualifier Codes Applied to Sample Results (NOTE: for organic analyses only detected target compounds are reported)

B Not detected substantially above (10 times) the level reported in the laboratory or field blanks (includes field, trip, rinsate, and equipment blanks).
C See report narrative for analyst's comments and observations concerning this result.
E Value exceeds a theoretically greater value (e.g., dissolved>total, orthophosphate>total phosphorus). However, the difference is within the expected precision of the analytical techniques and is not statistically significant.
J The identification of the analyte is acceptable; the reported value is an estimate.
K The identification of the analyte is acceptable; the reported value may be biased high. The actual value is expected to be less than the reported value.
L The identification of the analyte is acceptable; the reported value may be biased low. The actual value is expected to be greater than the reported value.
N There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification.
NJ There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification. The reported value is an estimate.
NA Not analyzed - analysis not performed.
NR Not requested - analysis not requested.
R The presence or absence of the analyte can not be determined from the data due to severe quality control problems. The data are rejected and considered unusable.
T Tentatively Identified Compound. Identified as a result of a library search using the EPA/NIST Mass Spectral Library. Standards were not used to verify the identity and quantity of the compound. The reported value is an estimate.
U The analyte was not detected at or above the reporting limit.
UJ The analyte was not detected at or above the reporting limit. The reporting limit is an estimate.
UL The analyte was not detected. The reporting limit is probably higher due to indications of a low bias.
< Less than.

Qualifier Codes Applied to Quality Control Results

A Quality control value is outside acceptance limits.
D Sample and/or laboratory duplicate values are below the reporting limit. No precision data reported.
TD Spike recovery too dilute for accurate quantitation.

Qualifier Codes Applied to Microbiology Results

< Less than.
<= Less than or equal to.
>= Greater than or equal to.
> Greater than.

Glossary:

() Numbers in parentheses are analytical spike recoveries (e.g., post-digestion spikes).
[] Numbers in brackets are matrix spike recoveries (e.g., pre-digestion spikes).
CFU Colony Forming Unit.
ISF A prepared sample aliquot fortified with a known concentration of target analyte(s) or a representative subset of target analytes and analyzed. Its purpose is to determine whether the sample matrix contributes bias to the analytical results.
LSF A sample aliquot fortified with a known concentration of analyte(s) or a representative subset of target analytes and carried throughout the entire lab method. It is analyzed to determine whether the sample matrix contributes bias to the analytical results.
MS/MSD Matrix spike/matrix spike duplicate; a known increment of target analyte added to a sample before preparation or analyses.
MSA Value obtained by Method of Standard Additions in which calibration standards are prepared in the sample matrix (see EPA method 200.9).
RPD Relative Percent Difference (RPD) is used to measure precision when duplicates are analyzed.
%Rec Percent Recovery (%Rec) is an expression of accuracy.

SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05043

INORGANIC ANALYTICAL SAMPLE RESULTS

	SAMPLE NUMBER: 04121501	04121503	04121505
	S1	S2	S3
	SAMPLE	SAMPLE	SAMPLE
Percent Dry Weight			
Percent Dry Weight (105C)	85.8 %	80.7 %	81.7 %
Perchlorate by IC			
Perchlorate	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg

ITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05043

INORGANIC QUALITY CONTROL RESULTS

SAMPLE NUMBER:	04121501	04121505
STATION ID:	S1	S3

Units:	RPD	% REC	RPD
--------	-----	-------	-----

Percent Dry Weight

Percent Dry Weight (105c)

Perchlorate by IC

Perchlorate

[94]	D
---	-----	---

[] = LSF

() = ISF

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Page 1 of 1

Site Name : ELKTON FARMS

Lab Request #: REQ05043

Wet Dry Conversion Table

The wet/dry weight conversion table is presented for the convenience of the data user. The attached analyst narratives state whether a test was determined on a wet or dry weight basis. Any difference in significant figures between the two columns is an artifact of the reporting function and does not imply that the calculated value has greater precision than the measured value.

<u>Sample Number</u>	<u>Station ID</u>					<u>Units</u>	<u>Wet</u>	<u>Dry</u>
04121501	S1	SAM	Percent Dry Weight 85.8 (105C)	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
04121503	S2	SAM	Percent Dry Weight 80.7 (105C)	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
04121505	S3	SAM	Percent Dry Weight 81.7 (105C)	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006

Perchlorate Determinations

Analyst:

Ronald H. Altman
Chemist

Method:

The ELKTON FARMS soil samples (REQ05043) were analyzed for Perchlorate using EPA Method 314.0¹ (Determination of Perchlorate in Drinking Water using Ion Chromatography). The soil samples were prepared for inorganic analysis by adding 20 mL of Milli-Q water to approximately four grams of the wet soil sample. The slurry was then vortexed for one minute. The prepared samples were centrifuged for 10 minutes at 2000 rpm. The liquid phase was filtered through a 0.45µm syringe filter prior to running the perchlorate analysis on the Dionex DX-600. A laboratory reagent blank (LRB), laboratory fortified blank (LFB) and a laboratory fortified blank at the maximum conductivity threshold (LFB at MCT) were prepared and taken through the process. In addition a matrix duplicate (LD2) and a matrix spike (LSF) were also prepared for each set of 10 samples and taken through the process.

Since no positive results were found for the soil samples, it was unnecessary to confirm the results by LC/MS.

¹ US EPA Method 314.0, Determination of Perchlorate in Drinking Water Using Ion Chromatography, Revision 1.0, November 1999

Percent Dry Weight Determinations

Analyst:

Thomas Reppert
Environmental Scientist

Method:

The soil samples from ELKTON FARMS (REQ05043) were analyzed for Percent Dry Weight. The samples were dried at 105°C following the procedure outlined in the Region III ASQAB laboratory SOP #R3QA056.2.

These results are to be used to convert analyte concentrations to a dry weight basis for organic and non-metal analyses. Normally, analytical values are reported on a wet weight basis for organics and non-metals.

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 1 of 2

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05043

ORGANIC ANALYTICAL SAMPLE RESULTS

Sample Number:	04121501	04121502	04121503	04121504	04121505
Station ID:	S1	S1-X	S2	S2-X	S3
	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
Nitroaromatics and Nitramines by HPLC					
4-Amino-2,6-dinitrotoluene		0.065 mg/Kg		0.062 mg/Kg	
2-Amino-4,6-dinitrotoluene		0.042 mg/Kg		0.045 mg/Kg	
Dinitrotoluene isomers (2,4- and 2,6-)		0.105 mg/Kg			
2,4,6-Trinitrotoluene		0.046 mg/Kg		0.017 J mg/Kg	
Percent Dry Weight					
Percent Dry Weight (105C)	85.8 %		80.7 %		81.7 %

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SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05043

ORGANIC ANALYTICAL SAMPLE RESULTS

Sample Number: 04121506

Station ID: S3-X

SAMPLE

Nitroaromatics and Nitramines by HPLC

4-Amino-2,6-dinitrotoluene	0.108 mg/Kg
2-Amino-4,6-dinitrotoluene	0.105 mg/Kg
Dinitrotoluene isomers (2,4- and 2,6-)	
2,4,6-Trinitrotoluene	0.345 mg/Kg

Percent Dry Weight

Percent Dry Weight (105C)

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05043

ORGANIC QUALITY CONTROL (SURROGATE RECOVERIES)

Matrix: SOLIDS

	SAMPLE NUMBER:	04121502	04121504	04121506
	STATION ID:	S1-X	S2-X	S3-X
<u>SURROGATES</u>	<u>LIMITS</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>
Nitroaromatics and Nitramines by HPLC	Range	% REC	% REC	% REC
1,2-Dinitrobenzene	(70-130)	110	100	101

SITE NAME : ELKTON FARMS

AB REQUEST # : REQ05043

ORGANIC QUALITY CONTROL (MATRIX SPIKE RECOVERIES)

Matrix : SOLIDS

SAMPLE NUMBER : 04121502

STATION ID : S1-X

ANALYTES	Spike	Recovery	Recovery	RPD	
	MS	MSD	Limits	RPD	Limits
	%	%	Range	RPD	Limit
Aroaromatics and Nitramines by HPLC					
-Amino-2,6-Dinitrotoluene	80	83	(70-130)	4	25
-Amino-4,6-Dinitrotoluene	102	101	(70-130)	1	25
,3-Dinitrobenzene	102	107	(70-130)	5	25
initrotoluene isomers (2,4- and 2,6-)	108	112	(70-130)	4	25
DX	90	101	(70-130)	12	25
etryl	94	98	(60-130)	4	25
itrobenzene	96	95	(70-130)	0	25
l-Nitrotoluene	89	96	(70-130)	8	25
l-Nitrotoluene	106	101	(70-130)	5	25
l-Nitrotoluene	95	96	(70-130)	1	25
IMX	93	92	(60-130)	1	25
,3,5-Trinitrobenzene	100	106	(70-130)	6	25
,4,6-Trinitrotoluene	93	100	(70-130)	8	25

SITE NAME: ELKTON FARMS

LAB REQUEST #:REQ05043

ORGANIC LABORATORY REAGENT BLANK RESULTS

Nitroaromatics and Nitramines by HPLC

Date Prepared: DEC-20-2004

SURROGATES

1,2-Dinitrobenzene

100 % REC

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 1 of 1

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05043

SUPPLEMENTAL SAMPLE INFORMATION

Nitroaromatics and Nitramines by HPLC

<u>SAMPLE #</u>	<u>SAMPLE NQL FACTOR</u>
04121502	1
04121504	1
04121506	1

NQL Factor is an overall correction factor applied to the method's Nominal Quantitation Limit to correct for analytical adjustments made during the analysis.

**USEPA Region III
Office of Analytical Services and Quality Assurance (OASQA)
Nitroaromatic and Nitramine Analysis
Nominal Quantitation Limits (NQL)**

Units: Soil = mg/Kg

Actual Quantitation Limit = (NQL Factor) X NQL

CAS #	Compound	NQL
35572-78-2	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	0.05
99-65-0	1,3-Dinitrobenzene (1,3-DNB)	0.05
121-14-2	2,4-Dinitrotoluene (2,4-DNT)	0.05
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.10
98-95-3	Nitrobenzene (NB)	0.05
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.10
99-35-4	1,3,5-Trinitrobenzene (1,3,5-TNB)	0.05
118-96-7	2,4,6-Trinitrotoluene (TNT)	0.05
1946-51-0	4-Amino-2,6-Dinitrotoluene (4-Am-DNT)	0.05
88-72-2	2-Nitrotoluene (2-NT)	0.05
99-08-1	3-Nitrotoluene (3-NT)	0.05
99-99-0	4-Nitrotoluene (4-NT)	0.05
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	0.10
606-20-2	2,6-Dinitrotoluene (2,6-DNT)	0.05

The "Nominal Quantitation Limit" listed for each target compound is based on the Superfund CLP Protocol. The Actual Quantitation Limits are related to the NQLs by the NQL Factor. This NQL Factor reflects procedural steps, e.g., extract dilution, which influence quantitation limits.

Nitroaromatic/Nitramine Analysis by HPLC

Analyst:

Jennifer Gundersen
Chemist

Method:

Three solid samples from ELKTON FARMS (REQ05043) were analyzed for nitroaromatic and nitramine explosives and related degradation products (SW-846 Method 8330 analytes). The samples were collected on December 14, 2004, extracted on December 19-20, 2004, and analyzed December 21-22, 2004. All samples were extracted and analyzed according to R3-QA221.1, a combined method based on SW-846 Methods 8000 and 8330.

All results are reported on an air dried weight basis. Results are qualified "J", estimated, when they are below the calibration range.

Quality Control:

All samples were extracted and analyzed within holding time.

Initial calibration and second source verification were within acceptance limits.

Continuing calibrations were within acceptance limits with the exception of nitrobenzene in one continuing calibration standard. The percent recovery was above QC acceptance limits.

Nitrobenzene was not detected in any samples and all other QC criteria for nitrobenzene were met. This is not expected to impact data quality.

All surrogate recoveries were within acceptance limits.

All matrix spike recoveries and relative percent differences were within acceptance limits.

Recoveries of lab fortified blanks (LFBs) and second source audits (LCMs) were within limits.

Lab method blanks (LRBs) showed no contamination by target analytes.



USEPA Contract Laboratory Program
Generic Chain of Custody

Req 05043

Reference Case 33696

Client No: R31884

SDG No:

L

Date Shipped: 12/14/2004 Carrier Name: Hand Delivery Airbill: ERRP121404 Shipped to: ASQAB USEPA Region III 701 Mapes Road Fort Meade MD 20755 (410) 305-2667	Chain of Custody Record		Sampler Signature:	For Lab Use Only Lab Contract No: _____ Unit Price: _____ Transfer To: _____ Lab Contract No: _____ Unit Price: _____	
	Relinquished By	(Date / Time)	Received By		(Date / Time)
	1	12/14/04 1800	Thomas R. Gant		12.15.04 1020
	2				
	3				
4					

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	FOR LAB USE ONLY Sample Condition On Receipt
R31884-S1	Surface Soil (0"-12")/ Philip Anderson	M/G	PER (50)	2633 (Ice Only) (1)	R31884-S1	S: 12/14/2004 12:30	04121501
R31884-S1-X	Surface Soil (0"-12")/ Philip Anderson	M/G	NIT_ARO (50)	2644 (Ice Only), 2645 (Ice Only) (2)	R31884-S1-X	S: 12/14/2004 12:30	02
R31884-S2	Surface Soil (0"-12")/ Philip Anderson	M/G	PER (50)	2648 (Ice Only) (1)	R31884-S2	S: 12/14/2004 15:30	03
R31884-S2-X	Surface Soil (0"-12")/ Philip Anderson	M/G	NIT_ARO (50)	2668 (Ice Only) (1)	R31884-S2-X	S: 12/14/2004 15:30	04
R31884-S3	Surface Soil (0"-12")/ Philip Anderson	M/G	PER (50)	2649 (Ice Only) (1)	R31884-S3	S: 12/14/2004 16:10	05
R31884-S3-X	Surface Soil (0"-12")/ Philip Anderson	M/G	NIT_ARO (50)	2671 (Ice Only) (1)	R31884-S3-X	S: 12/14/2004 16:10	06

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: R31884-S1, R31884-S1-X	Additional Sampler Signature(s): 	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:	
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>	
NIT_ARO = Nitroaromatics, PER = Perchlorates					

TR Number: 3-592370820-121404-0003

LABORATORY COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819, Phone 703/818-4200; Fax 703/818-

F2V5.1.043 Page 1 of 1

**U.S. EPA REGION III
Analytical Services & Quality Assurance Branch
Fort Meade, Maryland**

**ASQAB LABORATORY REPORT
FINAL DATA**

ELKTON FARMS

**Lab Request #: REQ05053
Request Form #: DAS R32050**



Report prepared on: March 17, 2005

Approval for release:

Patricia X. [Signature], Director
ASQAB Representative

Site contact(s): Lorie Baker (3HS34)
Alex Cox

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

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SITE NAME: ELKTON FARMS
LAB REQUEST # REQ05053

SAMPLE DESCRIPTIONS

Sample #	Station	Description	Matrix	Type	End Collection	
					Date	Time
05011201	S10	R31884-S10	Soil	GRAB	01/11/2005	09:25
✓ 05011202	S10-X	R31884-S10-X	Soil	GRAB	01/11/2005	09:25
05011203	S11	R31884-S11	Soil	GRAB	01/11/2005	11:25
05011204	S11-X	R31884-S11-X	Soil	GRAB	01/11/2005	11:25
05011205	S6	R31884-S6	Soil	GRAB	01/11/2005	13:10
05011206	S6-X	R31884-S6-X	Soil	GRAB	01/11/2005	13:10
05011207	S7	R31884-S7	Soil	GRAB	01/11/2005	15:15
05011208	S7-X	R31884-S7-X	Soil	GRAB	01/11/2005	15:15
05011209	SS10	R31884-SS10	Soil	GRAB	01/11/2005	10:00
05011210	SS10-X	R31884-SS10-X	Soil	GRAB	01/11/2005	10:00
05011211	SS11	R31884-SS11	Soil	GRAB	01/11/2005	11:45
05011212	SS11-X	R31884-SS11-X	Soil	GRAB	01/11/2005	11:45
05011213	SS6	R31884-SS6	Soil	GRAB	01/11/2005	13:55
05011214	SS6-X	R31884-SS6-X	Soil	GRAB	01/11/2005	13:55
05011215	SS7	R31884-SS7	Soil	GRAB	01/11/2005	15:25
05011216	SS7-X	R31884-SS7-X	Soil	GRAB	01/11/2005	15:25
05011217	S12	R31884-S12	Soil	GRAB	01/12/2005	11:25
05011218	S12-X	R31884-S12-X	Soil	GRAB	01/12/2005	11:25
05011219 <i>BKG</i>	S4	R31884-S4	Soil	GRAB	01/12/2005	12:30
05011220 <i>BKG</i>	S4-X	R31884-S4-X	Soil	GRAB	01/12/2005	12:30
✓ 05011221	S5	R31884-S5	Soil	GRAB	01/12/2005	11:10
✓ 05011222	S5-X	R31884-S5-X	Soil	GRAB	01/12/2005	11:10
05011223	S8	R31884-S8	Soil	GRAB	01/12/2005	09:10
05011224	S8-X	R31884-S8-X	Soil	GRAB	01/12/2005	09:10
05011225	S9	R31884-S9	Soil	GRAB	01/12/2005	10:10
05011226	S9-X	R31884-S9-X	Soil	GRAB	01/12/2005	10:10
05011227	SS12	R31884-SS12	Soil	GRAB	01/12/2005	11:30
05011228	SS12-X	R31884-SS12-X	Soil	GRAB	01/12/2005	11:30
05011229 <i>BKG</i>	SS4	R31884-SS4	Soil	GRAB	01/12/2005	12:40
05011230 <i>BKG</i>	SS4-X	R31884-SS4-X	Soil	GRAB	01/12/2005	12:40
✓ 05011231	SS5	R31884-SS5	Soil	GRAB	01/12/2005	11:15
✓ 05011232	SS5-X	R31884-SS5-X	Soil	GRAB	01/12/2005	11:15
05011233	SS8	R31884-SS8	Soil	GRAB	01/12/2005	09:15

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SITE NAME: ELKTON FARMS

LAB REQUEST # REQ05053

SAMPLE DESCRIPTIONS

<u>Sample #</u>	<u>Station</u>	<u>Description</u>		<u>Type</u>	<u>Date</u>	<u>Time</u>
05011234	SS8-X	R31884-SS8-X	Soil	GRAB	01/12/2005	09:15
05011235	SS9	R31884-SS9	Soil	GRAB	01/12/2005	10:30
05011236	SS9-X	R31884-SS9-X	Soil	GRAB	01/12/2005	10:30

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SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05053

TESTS REQUESTED

INORGANICS

050112

	01	03	05	07	09	11	13	15	17	19	21	23	25	27	29	31	33	35
Percent Dry Weight	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Perchlorate by IC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

ORGANICS

050112

	02	04	06	08	10	12	14	16	18	20	22	24	26	28	30	32	34	36
Nitroaromatics and Nitramines by HPLC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

(X = Test Requested)

USEPA Region III
Analytical Services & Quality Assurance Branch

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SITE NAME: ELKTON FARMS
LAB REQUEST #: REQ05053

QUALIFIER CODE AND GLOSSARY DEFINITIONS

Qualifier Codes Applied to Sample Results

B Not detected substantially above (10 times) the level reported in the laboratory or field blanks (includes field, trip, rinsate, and equipment blanks).

C See report narrative for analyst's comments and observations concerning this result.

E Value exceeds a theoretically greater value (e.g., dissolved>total, orthophosphate>total phosphorus). However, the difference is within the expected precision of the analytical techniques and is not statistically significant.

I An interference exists which masks the true response. See report narrative for explanation.

J The identification of the analyte is acceptable; the reported value is an estimate.

K The identification of the analyte is acceptable; the reported value may be biased high. The actual value is expected to be less than the reported value.

L The identification of the analyte is acceptable; the reported value may be biased low. The actual value is expected to be greater than the reported value.

N There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification.

NJ There is presumptive evidence that the analyte is present; the analyte is reported as a tentative identification. The reported value is an estimate.

NA Not analyzed - analysis not performed.

NR Not requested - analysis not requested.

R The presence or absence of the analyte can not be determined from the data due to severe quality control problems. The data are rejected and considered unusable.

T Tentatively Identified Compound. Identified as a result of a library search using the EPA/NIST Mass Spectral Library. Standards were not used to verify the identity and quantity of the compound. The reported value is an estimate.

U The analyte was not detected at or above the reporting limit.

UJ The analyte was not detected at or above the reporting limit. The reporting limit is an estimate.

UL The analyte was not detected. The reporting limit is probably higher due to indications of a low bias.

< Less than.

Qualifier Codes Applied to Quality Control Results

A Quality control value is outside acceptance limits.

D Sample and/or laboratory duplicate values are below the reporting limit. No precision data reported.

TD Spike recovery too dilute for accurate quantitation.

Qualifier Codes Applied to Microbiology Results

< Less than.

<= Less than or equal to.

>= Greater than or equal to.

> Greater than.

Glossary:

() Numbers in parentheses are analytical spike recoveries (e.g., post-digestion spikes).

[] Numbers in brackets are matrix spike recoveries (e.g., pre-digestion spikes).

CFU Colony Forming Unit.

ISF A prepared sample aliquot fortified with a known concentration of target analyte(s) or a representative subset of target analytes and analyzed. Its purpose is to determine whether the sample matrix contributes bias to the analytical results.

LSF A sample aliquot fortified with a known concentration of analyte(s) or a representative subset of target analytes and carried throughout the entire lab method. It is analyzed to determine whether the sample matrix contributes bias to the analytical results.

MS/MSD Matrix spike/matrix spike duplicate; a known increment of target analyte added to a sample before preparation or analyses.

MSA Value obtained by Method of Standard Additions in which calibration standards are prepared in the sample matrix (see EPA method 200.9).

RPD Relative Percent Difference (RPD) is used to measure precision when duplicates are analyzed.

%Rec Percent Recovery (%Rec) is an expression of accuracy.

U.S EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

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SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05053

INORGANIC ANALYTICAL SAMPLE RESULTS

SAMPLE NUMBER:	05011201	05011203	05011205	05011207	05011209
STATION ID:	S10	S11	S6	S7	SS10
	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
Percent Dry Weight					
Percent Dry Weight (105C)	80.5 %	79.9 %	81.6 %	81.6 %	79.7 %
Perchlorate by IC					
Perchlorate	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg

U.S EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05053

INORGANIC ANALYTICAL SAMPLE RESULTS

SAMPLE NUMBER:	05011211	05011213	05011215	05011217	05011219
STATION ID:	SS11	SS6	SS7	S12	S4
	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE

Percent Dry Weight

Percent Dry Weight (105C)

80.7 %

84.9 %

79.5 %

78.8 %

81.9 %

Perchlorate by IC

Perchlorate

<0.005 mg/Kg

<0.005 mg/Kg

<0.005 mg/Kg

<0.005 mg/Kg

<0.005 mg/Kg

U.S EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

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SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05053

INORGANIC ANALYTICAL SAMPLE RESULTS

SAMPLE NUMBER:	05011221	05011223	05011225	05011227	05011229
STATION ID:	S5	S8	S9	SS12	SS4
	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
Percent Dry Weight					
Percent Dry Weight (105C)	79.9 %	81.6 %	80.6 %	77.2 %	86.3 %
Perchlorate by IC					
Perchlorate	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg

SITE NAME : ELKTON FARMS

LAB REQUEST #: REQ05053

INORGANIC ANALYTICAL SAMPLE RESULTS

SAMPLE NUMBER:	05011231	05011233	05011235
STATION ID:	SS5	SS8	SS9
	SAMPLE	SAMPLE	SAMPLE

Percent Dry Weight

Percent Dry Weight (105C)

79.1 %	93.1 %	91.7 %
--------	--------	--------

Perchlorate by IC

Perchlorate

<0.005 mg/Kg	<0.005 mg/Kg	<0.005 mg/Kg
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ITE NAME: ELKTON FARMS

AB REQUEST #: REQ05053

INORGANIC QUALITY CONTROL RESULTS

	SAMPLE NUMBER:	05011217	05011235		
	STATION ID:	812	889		
	Units:	% REC	RPD	% REC	RPD
ercent Dry Weight					
Percent Dry Weight (105c)			1		1
erchlorate by IC					
Perchlorate		[87]	D	[96]	D

[] = LSF
() = ISF

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

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Site Name : ELKTON FARMS

Lab Request #: REQ05053

Wet Dry Conversion Table

The wet/dry weight conversion table is presented for the convenience of the data user. The attached analyst narratives state whether a test was determined on a wet or dry weight basis. Any difference in significant figures between the two columns is an artifact of the reporting function and does not imply that the calculated value has greater precision than the measured value.

<u>Sample Number</u>	<u>Station ID</u>						<u>Units</u>	<u>Wet</u>	<u>Dry</u>
05011201	S10	SAM	Percent Dry Weight (105C)	80.5	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011203	S11	SAM	Percent Dry Weight (105C)	79.9	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011205	S6	SAM	Percent Dry Weight (105C)	81.6	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011207	S7	SAM	Percent Dry Weight (105C)	81.6	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011209	SS10	SAM	Percent Dry Weight (105C)	79.7	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011211	SS11	SAM	Percent Dry Weight (105C)	80.7	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011213	SS6	SAM	Percent Dry Weight (105C)	84.9	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011215	SS7	SAM	Percent Dry Weight (105C)	79.5	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011217	S12	SAM	Percent Dry Weight (105C)	78.8	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011219	S4	SAM	Percent Dry Weight (105C)	81.9	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011221	S5	SAM	Percent Dry Weight (105C)	79.9	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011223	S8	SAM	Percent Dry Weight (105C)	81.6	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011225	S9	SAM	Percent Dry Weight (105C)	80.6	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011227	SS12	SAM	Percent Dry Weight (105C)	77.2	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011229	SS4	SAM	Percent Dry Weight (105C)	86.3	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011231	SS5	SAM	Percent Dry Weight (105C)	79.1	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.006
05011233	SS8	SAM	Percent Dry Weight (105C)	93.1	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.005
05011235	SS9	SAM	Percent Dry Weight (105C)	91.7	Perchlorate by IC	Perchlorate	mg/Kg	< 0.005	< 0.005

Perchlorate Determinations

Analyst:

Ronald H. Altman
Chemist

Method:

The ELKTON FARMS soil samples (REQ05053) were analyzed for Perchlorate using EPA Method 314.0¹ (Determination of Perchlorate in Drinking Water using Ion Chromatography). The soil samples were prepared for inorganic analysis by adding 20 mL of Milli-Q water to approximately four grams of the wet soil sample. The slurry was then vortexed for one minute. The prepared samples were centrifuged for 10 minutes at 2000 rpm. The liquid phase was filtered through a 0.45µm syringe filter prior to running the perchlorate analysis on the Dionex DX-600. A laboratory reagent blank (LRB), laboratory fortified blank (LFB) and a laboratory fortified blank at the maximum conductivity threshold (LFB at MCT) were prepared and taken through the process. In addition a matrix duplicate (LD2) and a matrix spike (LSF) were also prepared for each set of 10 samples and taken through the process. The perchlorate results are reported on a wet basis.

Since no positive results were found for the soil samples, it was unnecessary to confirm the results by LC/MS.

¹ US EPA Method 314.0, Determination of Perchlorate in Drinking Water Using Ion Chromatography, Revision 1.0, November 1999

Percent Dry Weight Determinations

Analyst:

Thomas Reppert
Environmental Scientist

Method:

The soil samples from ELKTON FARMS (REQ05053) were analyzed for Percent Dry Weight. The samples were dried at 105°C following the procedure outlined in the Region III ASQAB laboratory SOP #R3QA056.2.

These results are to be used to convert analyte concentrations to a dry weight basis for organic and non-metal analyses. Normally, analytical values are reported on a wet weight basis for organics and non-metals.

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 1 of 6

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC ANALYTICAL SAMPLE RESULTS

Sample Number:	05011201	05011203	05011205	05011206	05011207
Station ID:	S10	S11	S6	S6-X	S7
	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
Nitroaromatics and Nitramines by HPLC					
4-Amino-2,6-dinitrotoluene				0.233 mg/Kg	
2-Amino-4,6-dinitrotoluene				0.438 mg/Kg	
1,3-Dinitrobenzene					
Dinitrotoluene isomers (2,4- and 2,6-)					
1,3,5-Trinitrobenzene					
2,4,6-Trinitrotoluene				0.0593 mg/Kg	
Percent Dry Weight					
Percent Dry Weight (105C)	80.5 %	79.9 %	81.6 %		81.6 %

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 2 of 6

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC ANALYTICAL SAMPLE RESULTS

	Sample Number:	05011208	05011209	05011210	05011211	05011213
	Station ID:	S7-X	SS10	SS10-X	SS11	SS6
		SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
Nitroaromatics and Nitramines by HPLC						
4-Amino-2,6-dinitrotoluene		9.0 J mg/Kg				
2-Amino-4,6-dinitrotoluene		16 J mg/Kg				
1,3-Dinitrobenzene		0.919 mg/Kg				
Dinitrotoluene isomers (2,4- and 2,6-)		5.4 J mg/Kg				
1,3,5-Trinitrobenzene		48 J mg/Kg				
2,4,6-Trinitrotoluene		1300 mg/Kg		0.0483 mg/Kg		
Percent Dry Weight						
Percent Dry Weight (105C)			79.7 %		80.7 %	84.9 %

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 3 of 6

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC ANALYTICAL SAMPLE RESULTS

	Sample Number:	05011214	05011215	05011216	05011217	05011218
	Station ID:	SS6-X	SS7	SS7-X	S12	S12-X
		SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE
Nitroaromatics and Nitramines by HPLC						
4-Amino-2,6-dinitrotoluene				0.380 mg/Kg		0.731 mg/Kg
2-Amino-4,6-dinitrotoluene		0.0547 mg/Kg		0.846 mg/Kg		0.714 mg/Kg
1,3-Dinitrobenzene				0.144 mg/Kg		0.0545 mg/Kg
Dinitrotoluene isomers (2,4- and 2,6-)				1.2 J mg/Kg		0.121 mg/Kg
1,3,5-Trinitrobenzene		0.02 J mg/Kg		30.5 mg/Kg		192 mg/Kg
2,4,6-Trinitrotoluene		0.358 mg/Kg				

Percent Dry Weight

Percent Dry Weight (105C)

79.5 %

78.8 %

~~0.05 x 110 = 5~~
~~0.05 x 580~~

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 4 of 6

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC ANALYTICAL SAMPLE RESULTS

Sample Number:

05011219

05011221

05011222 *not det*

05011223

05011224

Station ID:

S4

S5

S5-X

S8

S8-X

SAMPLE

SAMPLE

SAMPLE

SAMPLE

SAMPLE

Nitroaromatics and Nitramines by HPLC

4-Amino-2,6-dinitrotoluene

0.961 mg/Kg

2-Amino-4,6-dinitrotoluene

1.12 mg/Kg

1,3-Dinitrobenzene

Dinitrotoluene isomers (2,4- and 2,6-)

1,3,5-Trinitrobenzene

0.152 mg/Kg

2,4,6-Trinitrotoluene

2.92 mg/Kg

0.0730 mg/Kg

Percent Dry Weight

Percent Dry Weight (105C)

81.9 %

79.9 %

81.6 %

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 5 of 6

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC ANALYTICAL SAMPLE RESULTS

Sample Number:	05011225	05011227	05011228	05011229	05011231
Station ID:	S9	SS12	SS12-X	SS4	SS5
	SAMPLE	SAMPLE	SAMPLE	SAMPLE	SAMPLE

Nitroaromatics and Nitramines by HPLC

4-Amino-2,6-dinitrotoluene
 2-Amino-4,6-dinitrotoluene
 1,3-Dinitrobenzene
 Dinitrotoluene isomers (2,4- and 2,6-)
 1,3,5-Trinitrobenzene
 2,4,6-Trinitrotoluene

4.86 mg/Kg
 6.35 mg/Kg
 0.173 mg/Kg
 0.203 mg/Kg
 3.84 mg/Kg

Percent Dry Weight

Percent Dry Weight (105C)

80.6 %

77.2 %

86.3 %

79.1 %

15.43

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 6 of 6

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC ANALYTICAL SAMPLE RESULTS

Sample Number:	05011232 <i>Box del</i>	05011233	05011235
Station ID:	SS5-X	SS8	SS9
	SAMPLE	SAMPLE	SAMPLE
<hr/>			
Nitroaromatics and Nitramines by HPLC			
4-Amino-2,6-dinitrotoluene	7.08 mg/Kg		
2-Amino-4,6-dinitrotoluene	8.04 mg/Kg		
1,3-Dinitrobenzene	0.03 J mg/Kg		
Dinitrotoluene isomers (2,4- and 2,6-)	0.219 mg/Kg		
1,3,5-Trinitrobenzene	0.296 mg/Kg		
2,4,6-Trinitrotoluene	10.1 mg/Kg		
<hr/>			
Percent Dry Weight	<i>25.76</i>		
Percent Dry Weight (105C)		93.1 %	91.7 %

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC QUALITY CONTROL (SURROGATE RECOVERIES)

Matrix: SOLIDS

	SAMPLE NUMBER:	05011202	05011204	05011206	05011208	05011210	05011212	05011214	05011216
	STATION ID:	S10-X	S11-X	S6-X	S7-X	SS10-X	SS11-X	SS6-X	SS7-X
<u>SURROGATES</u>	<u>LIMITS</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>
Nitroaromatics and Nitramines by HPLC	Range	% REC	% REC	% REC	% REC	% REC	% REC	% REC	% REC
1,2-Dinitrobenzene	(70-130)	94	97	91	122	103	94	95	87

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 2 of 3

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC QUALITY CONTROL (SURROGATE RECOVERIES)

Matrix: SOLIDS

SAMPLE NUMBER:	05011218	05011220	05011222	05011224	05011226	05011228	05011230	05011232
STATION ID:	S12-X	S4-X	S5-X	S8-X	S9-X	SS12-X	SS4-X	SS5-X
<u>SURROGATES</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>
<u>LIMITS</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>	<u>SAMPLE</u>
Range	% REC	% REC	% REC	% REC	% REC	% REC	% REC	% REC
1,2-Dinitrobenzene	100	94	96	97	96	83	96	88

Nitroaromatics and Nitramines by HPLC
1,2-Dinitrobenzene

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC QUALITY CONTROL (SURROGATE RECOVERIES)

Matrix: SOLIDS

SAMPLE NUMBER: 05011234 05011236

STATION ID: SS8-X SS9-X

SURROGATESLIMITS SAMPLE SAMPLE

Nitroaromatics and Nitramines by HPLC

Range % REC % REC

1,2-Dinitrobenzene

(70-130) 102 98

SITE NAME : ELKTON FARMS

REQUEST # : REQ05053

ORGANIC QUALITY CONTROL (MATRIX SPIKE RECOVERIES)

Matrix : SOLIDS

SAMPLE NUMBER : 05011218

STATION ID : S12-X

ALYTES

	Spike	Recovery	Recovery	RPD	
	<u>MS</u>	<u>MSD</u>	<u>Limits</u>	<u>RPD</u>	<u>Limits</u>
	%	%	Range	RPD	Limit
roaromatics and Nitramines by HPLC					
Amino-2,6-Dinitrotoluene	188 A	16 A	(70-130)	169 A	25
Amino-4,6-Dinitrotoluene	135 A	67 A	(70-130)	67 A	25
3-Dinitrobenzene	106	112	(70-130)	6	25
Nitrotoluene isomers (2,4- and 2,6-)	118	109	(70-130)	8	25
K	132 A	128	(70-130)	3	25
tryl	95	98	(60-130)	3	25
robenzene	110	132 A	(70-130)	18	25
Nitrotoluene	97	103	(70-130)	6	25
Nitrotoluene	105	103	(70-130)	2	25
Nitrotoluene	93	96	(70-130)	3	25
K	111	102	(60-130)	9	25
3,5-Trinitrobenzene	114	130	(70-130)	13	25
4,6-Trinitrotoluene	I	I	(70-130)	I	25

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

ORGANIC LABORATORY REAGENT BLANK RESULTS

Nitroaromatics and Nitramines by HPLC

Date Prepared: JAN-19-2005

SURROGATES

1,2-Dinitrobenzene

99 % REC

U.S. EPA REGION III ANALYTICAL SERVICES & QUALITY ASSURANCE BRANCH

Page 1 of 1

SITE NAME: ELKTON FARMS

LAB REQUEST #: REQ05053

SUPPLEMENTAL SAMPLE INFORMATION

Nitroaromatics and Nitramines by HPLC

<u>SAMPLE #</u>	<u>SAMPLE NQL FACTOR</u>
05011202	1
05011204	1
05011206	1
05011208	1
05011210	1
05011212	1
05011214	1
05011216	1
05011218	1
05011220	1
05011222	1
05011224	1
05011226	1
05011228	1
05011230	1
05011232	1
05011234	1
05011236	1

NQL Factor is an overall correction factor applied to the method's Nominal Quantitation Limit to correct for analytical adjustments made during the analysis.

USEPA Region III
Office of Analytical Services and Quality Assurance (OASQA)
Nitroaromatic and Nitramine Analysis
Nominal Quantitation Limits (NQL)

Units: Soil = mg/Kg

Actual Quantitation Limit = (NQL Factor) X NQL

CAS #	Compound	NQL
35572-78-2	2-Amino-4,6-dinitrotoluene (2-Am-DNT) ✓	0.05
99-65-0	1,3-Dinitrobenzene (1,3-DNB) ✓	0.05
121-14-2	2,4-Dinitrotoluene (2,4-DNT) ✓	0.05
2691-41-0	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) ✓	0.10
98-95-3	Nitrobenzene (NB)	0.05
121-82-4	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) ✓	0.10
99-35-4	1,3,5-Trinitrobenzene (1,3,5-TNB) ✓	0.05
118-96-7	2,4,6-Trinitrotoluene (TNT) ✓	0.05
1946-51-0	4-Amino-2,6-Dinitrotoluene (4-Am-DNT) ✓	0.05
88-72-2	2-Nitrotoluene (2-NT)	0.05
99-08-1	3-Nitrotoluene (3-NT)	0.05
99-99-0	4-Nitrotoluene (4-NT)	0.05
479-45-8	Methyl-2,4,6-trinitrophenylnitramine (Tetryl) ✓	0.10
606-20-2	2,6-Dinitrotoluene (2,6-DNT)	0.05

The "Nominal Quantitation Limit" listed for each target compound is based on the Superfund CLP Protocol. The Actual Quantitation Limits are related to the NQLs by the NQL Factor. This NQL Factor reflects procedural steps, e.g., extract dilution, which influence quantitation limits.

Nitroaromatic/Nitramine Analysis by HPLC

Analyst:

Jennifer Gundersen
Chemist

Method:

Eighteen solid samples from ELKTON FARMS (REQ05053) were analyzed for nitroaromatic and nitramine explosives and related degradation products (SW-846 Method 8330 analytes). The samples were collected on January 11 and 12, 2005, extracted on January 19-20, 2005, and analyzed January 24-26, 2005. All samples were extracted and analyzed according to R3-QA221.1, a combined method based on SW-846 Methods 8000 and 8330.

All results are reported on an air dried weight basis. Results are qualified "J", estimated, when they are below or above the calibration range. Only detected results are reported.

In addition to the Method 8330 analytes, 3,5-dinitroaniline (3,5-DNA), a common degradation product of nitroaromatic explosives, was detected in several samples. Detection was based on comparison of retention time and a library spectrum of the authentic compound. No calibration was made and no quantitation was done. The samples containing 3,5-DNA are noted on the electronic deliverables report. These results are included for the client's information only. Please contact the analyst if there are questions or estimates of concentration are needed.

Quality Control:

All samples were extracted and analyzed within holding time.

Initial calibration and second source verification were within acceptance limits.

Continuing calibrations were within acceptance limits.

All surrogate recoveries were within acceptance limits.

Due to the high concentration of target analytes in sample 05011218, several matrix spike recoveries and relative percent differences were outside of acceptance limits. Outliers are qualified "A". Results for the MS, MSD and RPD for 2,4,6-trinitrotoluene for sample 05011218 were reported with the "I" qualifier since an interference existed in the sample which prevented accurate quantitation of the matrix spike/matrix spike duplicate.

Recoveries of lab fortified blanks (LFBs) and second source audits (LCMs) were within acceptance limits with the exception of nitrobenzene in the LCM. The nitrobenzene recovery was above the acceptance limit due to a coeluting interference.

Lab method blanks (LRBs) showed no contamination by target analytes.

Several samples required dilution to bring target analytes within calibration range. For two samples, 050112-08 (S7-X) and 050112-16 (SS7-X), dilutions were prepared to bring TNT into calibration range but this resulted in other compounds (1,3,5-TNB, 4-am-2,6-DNT, 2-am-4,6-DNT, and 2,4-/2,6-DNT isomers in 050112-08 and 1,3,5-TNB in 050112-16) being diluted out in the dilution but above the calibration range in the initial extract. Results for affected analytes have been flagged "J" for both samples.

The following samples required dilution:

Sample #	Station ID	Dilution level
050112-08	S7-X	2000x
050112-16	SS7-X	100X
050112-18	S12-X	500X
050112-22	S5-X	10X
050112-28	SS12-X	10X
050112-32	SS5-X	20X



USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case 33696

Client No:

R32050

SDG No:

L

Date Shipped: 1/11/2005
Carrier Name: Hand Delivery
Airbill: ERRP011105
Shipped to: ASQAB
USEPA Region III
701 Mapes Road
Fort Meade MD 20755
(410) 305-2667

Chain of Custody Record

Relinquished By (Date / Time)

[Signature] 1/11/05 1700

2

3

4

Sampler

Signature:

Received By (Date / Time)

CA HARRIS 1-12-05 @ 08:15

For Lab Use Only

Lab Contract No:

Unit Price:

Transfer To:

Lab Contract No:

Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	FOR LAB USE ONLY Sample Condition On Receipt
R31884-S10	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	PER (50)	2646 (Ice Only) (1)	R31884-S10	S: 1/11/2005 9:25	05012-01
R31884-S10-X	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	NIT_ARO (50)	2669 (Ice Only) (1)	R31884-S10-X	S: 1/11/2005 9:25	-02
R31884-S11	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	PER (50)	2647 (Ice Only) (1)	R31884-S11	S: 1/4/2005 11:25	-03
R31884-S11-X	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	NIT_ARO (50)	2670 (Ice Only) (1)	R31884-S11-X	S: 1/11/2005 11:25	-04
R31884-S6	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	PER (50)	2652 (Ice Only) (1)	R31884-S6	S: 1/11/2005 13:10	-05
R31884-S6-X	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	NIT_ARO (50)	2674 (Ice Only) (1)	R31884-S6-X	S: 1/11/2005 13:10	-06
R31884-S7	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	PER (50)	2653 (Ice Only) (1)	R31884-S7	S: 1/11/2005 15:15	-07
R31884-S7-X	Surface Soil (0"-12")/ Philip Anderson <i>PA</i>	M/G	NIT_ARO (50)	2675 (Ice Only) (1)	R31884-S7-X	S: 1/11/2005 15:15	-08
R31884-SS10	Subsurface Soil (>12")/ Philip Anderson <i>PA</i>	M/G	PER (50)	2657 (Ice Only) (1)	R31884-SS10	S: 1/11/2005 10:00	-09
R31884-SS10-X	Subsurface Soil (>12")/ Philip Anderson <i>PA</i>	M/G	NIT_ARO (50)	2678 (Ice Only) (1)	R31884-SS10-X	S: 1/11/2005 10:00	-10

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s): <i>Philip Anderson</i>	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>
NIT_ARO = Nitroaromatics, PER = Perchlorates				

TR Number: 3-592370820-011105-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-

20C / Sherrill 1C

LABORATORY COPY



USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case 33696

Client No: R32050

SDG No:

L

Date Shipped: 1/11/2005 Carrier Name: Hand Delivery Airbill: ERRP011105 Shipped to: ASQAB USEPA Region III 701 Mapes Road Fort Meade MD 20755 (410) 305-2667	Chain of Custody Record		Sampler Signature:	For Lab Use Only Lab Contract No: _____ Unit Price: _____ Transfer To: _____ Lab Contract No: _____ Unit Price: _____	
	Relinquished By	(Date / Time)	Received By		(Date / Time)
		1/11/05 1700	Philip Anderson		1-12-05 @ 08:10
	2				
	3				
4					

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	FOR LAB USE ONLY Sample Condition On Receipt
R31884-SS11	Subsurface Soil (>12")/ Philip Anderson	M/G	PER (50)	2658 (Ice Only) (1)	R31884-SS11	S: 1/11/2005 11:45	050112-11
R31884-SS11-X	Subsurface Soil (>12")/ Philip Anderson	M/G	NIT_ARO (50)	2679 (Ice Only) (1)	R31884-SS11-X	S: 1/11/2005 11:45	-12
R31884-SS6	Subsurface Soil (>12")/ Philip Anderson	M/G	PER (50)	2664 (Ice Only) (1)	R31884-SS6	S: 1/11/2005 13:55	-13
R31884-SS6-X	Subsurface Soil (>12")/ Philip Anderson	M/G	NIT_ARO (50)	2686 (Ice Only) (1)	R31884-SS6-X	S: 1/11/2005 13:55	-14
R31884-SS7	Subsurface Soil (>12")/ Philip Anderson	M/G	PER (50)	2665 (Ice Only) (1)	R31884-SS7	S: 1/11/2005 15:25	-15
R31884-SS7-X	Subsurface Soil (>12")/ Philip Anderson	M/G	NIT_ARO (50)	2687 (Ice Only) (1)	R31884-SS7-X	S: 1/11/2005 15:25	-16

Shipment for Case Complete? <input type="checkbox"/>	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s): 	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>
NIT_ARO = Nitroaromatics, PER = Perchlorates				

TR Number: 3-592370820-011105-0001

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-

LABORATORY COPY



**USEPA Contract Laboratory Program
Generic Chain of Custody**

Reference Case **33696**

Client No: **R32050**

SDG No:

L

Date Shipped: 1/12/2005
Carrier Name: Hand Delivery
Airbill: errp011205
Shipped to: ASQAB
USEPA Region III
701 Mapes Road
Fort Meade MD 20755
(410) 305-2667

Chain of Custody Record

Relinquished By (Date / Time)

1 *[Signature]* 1/12/05 1700

2

3

4

Sampler
Signature: *[Signature]*

Received By (Date / Time)

[Signature] 1.12.05 0345 PM

For Lab Use Only

Lab Contract No:

Unit Price:

Transfer To:

Lab Contract No:

Unit Price:

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	FOR LAB USE ONLY Sample Condition On Receipt
R31884-S12	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2634 (Ice Only) (1)	R31884-S12	S: 1/12/2005 11:25	056112-17
R31884-S12-X	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2642 (Ice Only) (1)	R31884-S12-X	S: 1/12/2005 11:25	-18

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC: R31884-S12, R31884-S12-X	Additional Sampler Signature(s): <i>Philip Anderson</i> <i>Philip Anderson</i>	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key:	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>

NIT_ARO = Nitroaromatics, PER = Perchlorates

IR Number: **3-592370820-011205-0002**

*R provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-

LABORATORY COPY



USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case **33696**

Client No: R32050

SDG No:

L

Date Shipped: 1/12/2005
Carrier Name: Hand Delivery
Airbill: ERRP011205
Shipped to: ASQAB
USEPA Region III
701 Mapes Road
Fort Meade MD 20755
(410) 305-2667

Chain of Custody Record

Relinquished By (Date / Time)

1 *[Signature]* 1/12/05 1700

2

3

4

Sampler Signature: *[Signature]*

Received By (Date / Time)

Callahan 1-12-05 0345 PM

For Lab Use Only

Lab Contract No: _____

Unit Price: _____

Transfer To: _____

Lab Contract No: _____

Unit Price: _____

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	FOR LAB USE ONLY Sample Condition On Receipt
R31884-S4	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2650 (Ice Only) (1)	R31884-S4	S: 1/12/2005 12:30	050112-19
R31884-S4-X	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2672 (Ice Only) (1)	R31884-S4-X	S: 1/12/2005 12:30	-20
R31884-S5	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2651 (Ice Only) (1)	R31884-S5	S: 1/12/2005 11:10	-21
R31884-S5-X	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2673 (Ice Only) (1)	R31884-S5-X	S: 1/12/2005 11:10	-22
R31884-S8	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2654 (Ice Only) (1)	R31884-S8	S: 1/12/2005 9:10	-23
R31884-S8-X	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2676 (Ice Only) (1)	R31884-S8-X	S: 1/12/2005 9:10	-24
R31884-S9	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2655 (Ice Only) (1)	R31884-S9	S: 1/12/2005 10:10	-25
R31884-S9-X	Surface Soil (0"-12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2677 (Ice Only) (1)	R31884-S9-X	S: 1/12/2005 10:10	-26
R31884-SS12	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2659 (Ice Only) (1)	R31884-SS12	S: 1/12/2005 11:30	-27
R31884-SS12-X	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2680 (Ice Only) (1)	R31884-SS12-X	S: 1/12/2005 11:30	-28

Shipment for Case
Complete? **N**

Sample(s) to be used for laboratory QC:

Additional Sampler Signature(s):
Philip Anderson
Philip Anderson

Cooler Temperature
Upon Receipt:

Chain of Custody Seal Number:

Analysis Key:

Concentration: L = Low, M = Low/Medium, H = High

Type/Designate: Composite = C, Grab = G

Custody Seal Intact? ☐

Shipment Iced? ☐

NIT_ARO = Nitroaromatics, PER = Perchlorates

TR Number: **3-592370820-011205-0001**

LABORATORY COPY

OR provides preliminary results. Requests for preliminary results will increase analytical costs.
Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-

F2V5.1.043 Page 1 of 2



USEPA Contract Laboratory Program
Generic Chain of Custody

Reference Case **33696**

Client No: R32050

SDG No:

L

Date Shipped: 1/12/2005
Carrier Name: Hand Delivery
Airbill: ERRP011205
Shipped to: ASQAB
USEPA Region III
701 Mapes Road
Fort Meade MD 20755
(410) 305-2667

Chain of Custody Record

Sampler Signature: *[Signature]*

Relinquished By (Date / Time)

Received By (Date / Time)

1 *[Signature]* 1/12/05 1700

[Signature] 1.12.05 0345 PM

2

3

4

For Lab Use Only

Lab Contract No: _____

Unit Price: _____

Transfer To: _____

Lab Contract No: _____

Unit Price: _____

SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	FOR LAB USE ONLY Sample Condition On Receipt
R31884-SS4	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2662 (Ice Only) (1)	R31884-SS4	S: 1/12/2005 12:40	050112-29
R31884-SS4-X	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2684 (Ice Only) (1)	R31884-SS4-X	S: 1/12/2005 12:40	- 30
R31884-SS5	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2663 (Ice Only) (1)	R31884-SS5	S: 1/12/2005 11:15	- 31
R31884-SS5-X	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2685 (Ice Only) (1)	R31884-SS5-X	S: 1/12/2005 11:15	- 32
R31884-SS8	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2666 (Ice Only) (1)	R31884-SS8	S: 1/12/2005 9:15	- 33
R31884-SS8-X	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2688 (Ice Only) (1)	R31884-SS8-X	S: 1/12/2005 9:15	- 34
R31884-SS9	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	PER (50)	2667 (Ice Only) (1)	R31884-SS9	S: 1/12/2005 10:30	- 35
R31884-SS9-X	Subsurface Soil (>12")/ Philip Anderson <i>[Signature]</i>	M/G	NIT_ARO (50)	2689 (Ice Only) (1)	R31884-SS9-X	S: 1/12/2005 10:30	- 36

Shipment for Case Complete? <input type="checkbox"/>	Sample(s) to be used for laboratory QC:	Additional Sampler Signature(s): <i>Philip Anderson</i> <i>Philip Anderson</i>	Cooler Temperature Upon Receipt:	Chain of Custody Seal Number:
Analysis Key: NIT_ARO = Nitroaromatics, PER = Perchlorates	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Custody Seal Intact? <input type="checkbox"/>	Shipment Iced? <input type="checkbox"/>

TR Number: **3-592370820-011205-0001**

LABORATORY COPY

PR provides preliminary results. Requests for preliminary results will increase analytical costs.

Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-

F2V5.1.043 Page 2 of 2



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
ENVIRONMENTAL SCIENCE CENTER
701 MAPES ROAD
FORT MEADE, MARYLAND 20755-5350

DATE : February 14, 2005
SUBJECT: Region III Data QA Review
FROM : Khin-Cho Thaung *KCT*
Region III ESAT RPO (3EA20)
TO : Lorie Baker
Regional Project Manager (3HS34)

Attached is the inorganic data validation report for the Elkton Farm site (Case #: 33696, SDG#: MC02G9, MC02H2) completed by the Region III Environmental Services Assistance Team (ESAT) contractor under the direction of Region III EAID.

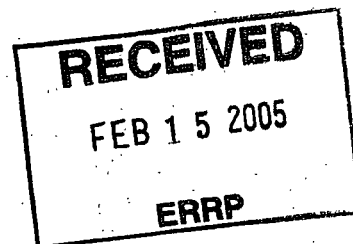
If you have any questions regarding this review, please call me at (410) 305-2743.

Attachments

cc: Peggy Smith (MDE)

TO File #: 0015

TDF#: 0179



ANALYTICAL SERVICES AND QUALITY ASSURANCE BRANCH



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Customer Service Hotline: 1-800-438-2474

DATE: February 7, 2005

SUBJECT: Level IM2 Inorganic Data Validation for Case 33696
SDG: MC02G9, MC02H2
Site: Elkton Farm Firehole

FROM: Shilpa Udani *gu*
Inorganic Data Reviewer

Through: Mahboobeh Mecanic *mm*
Senior Oversight Chemist

TO: Khin-Cho Thaung
ESAT Region 3 Project Officer

OVERVIEW

Case 33696, Sample Delivery Groups (SDGs) MC02G9 and MC02H2, consisted of twenty one (21) soil samples submitted to Liberty Analytical Corporation (LIBRTY) for total metals and cyanide (CN⁻) analyses. The sample set include two (2) field duplicate pairs. Samples were analyzed in accordance with Contract Laboratory Program (CLP) Statement of Work (SOW) ILM05.3 through Routine Analytical Services (RAS) program.

SUMMARY

All samples were successfully analyzed for all Target Analyte List (TAL) parameters. Areas of concern with respect to data usability are listed below.

Data in this Case have been impacted by outliers in laboratory blanks as well as the matrix spike, laboratory duplicate, ICP serial dilution and ICP-AES interference check sample analyses. Details for these outliers are discussed under "Minor Problems", specific samples affected are outlined in "Table 1A" and qualified analytical results for all samples are summarized on Data Summary Forms (DSFs).

MINOR PROBLEMS

Preparation blank (PB) and/or Continuing Calibration (CCBs) blanks had reported results greater than the Method Detection Limits (MDL) for analytes listed below. Positive results reported in affected samples which are less than or equal to five times ($\leq 5X$) blank concentrations may be biased high and have been qualified "B" on DSFs.

<u>SDG</u>	<u>Blank</u>	<u>Affected Analytes</u>
MC02G9	PB	antimony (Sb), sodium (Na)
MC02H2	PB	Sb, calcium (Ca), Na, zinc (Zn)
	CCB	beryllium (Be)

Following samples were reanalyzed at dilution factors listed below in order to bring the concentrations of following analytes within the established calibration range. Results for these analytes are reported from the diluted analyses and annotated with a "+" on the DSFs.

<u>SDG</u>	<u>Sample</u>	<u>Analyte</u>	<u>Dilution Factor</u>
MC02G9	MC02H6	Cu, zinc (Zn)	2 X
MC02H2	MC02J8	Fe, Zn	2 X
	MC02K2	Ba, Fe, Zn	2 X

Reported results for field duplicate pair MC02H4/MC02H9 in SDG MC02H2 were within 35% RPD, $\pm 2XCRQL$ for all analytes except Ba, Cd, Cr, and Cu.

Reported results for field duplicate pair MC02J8/MC02K2 in SDG MC02H2 were within 35% RPD, $\pm 2XCRQL$ for all analytes except Al, Ca, Cu and Ni.

Positive results which are less than the Contract Required Quantitation Limit (CRQL) but greater than Method Detection Limit (MDL) have been qualified "J" on the DSFs unless superseded by "B".

Data for Case 33696, SDG MC02G9 and MC02H2, were reviewed in accordance with National Functional Guidelines for Evaluating Inorganic Analyses with Modification for use with Region III.

ATTACHMENTS

INFORMATION REGARDING REPORT CONTENT

Tables 1A are summary of qualifiers applied to the laboratory-generated results during data validation.

TABLES 1A SUMMARY OF QUALIFIERS ON DATA SUMMARY FORMS AFTER DATA VALIDATION

TABLE 1B CODES USED IN COMMENTS COLUMN OF TABLES 1A

APPENDIX A GLOSSARY OF DATA QUALIFIER CODES

APPENDIX B DATA SUMMARY FORM(S)

APPENDIX C CHAIN OF CUSTODY RECORD(S)

APPENDIX D LABORATORY CASE NARRATIVE(S)

DCN:33696.IM2

**TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY
FORM AFTER DATA VALIDATION**

Case 33696, SDG MC02H2

<u>ANALYTE</u>	<u>SAMPLES AFFECTED</u>	<u>POSITIVE VALUES</u>	<u>NON DETECTED VALUES</u>	<u>BIAS</u>	<u>COMMENTS*</u>
Sb	MC02H2, MC02H3, MC02J0, MC02J1, MC02J2, MC02J3, MC02J7, MC02K1, MC02K3, MC02K4, MC02K5, MC02K6	B		High	PB (0.344 J mg/Kg) MSL (44%)
	MC02H8, MC02J6 MC02J8, MC02K2	L	UL	Low	MSL(44%)
	MC02H4, MC02H9,	J			> MDL < CRQL MSL(44%)
As	MC02K5	J			> MDL < CRQL DUP (94%) PBN (-0.356 J mg/Kg)
	All Samples Except MC02K5	J			DUP (94%)
Ba	All Samples	J			DUP (70%)
Be	MC02K5	B		High	CCB (0.210 J ug/L)
Cd	All Samples	J	UJ		DUP (75%)
Ca	MC02K5, MC02K6	B		High	PB (28.173 J mg/Kg)
Cr	All Samples	J			DUP (35%)
Cu	All Samples	L		Ext. Low	MSE (-51%)
Fe	All Samples	J			DUP (120%)
Pb	All Samples	J			DUP (117%)
Mn	All Samples	J			DUP (47%)

* See explanation of comments in Table 1B

TABLE 1A
SUMMARY OF QUALIFIERS ON DATA SUMMARY
FORM AFTER DATA VALIDATION

Case 33696, SDG MC02H2

<u>ANALYTE</u>	<u>SAMPLES</u> <u>AFFECTED</u>	<u>POSITIVE</u> <u>VALUES</u>	<u>NON</u> <u>DETECTED</u> <u>VALUES</u>	<u>BIAS</u>	<u>COMMENTS*</u>
CN ⁻	MC02K1, MC02K5, MC02K6		UL	Low	CBN (-1.080 J ug/L)

* See explanation of comments in Table 1B

APPENDIX A
Glossary of Qualifier Codes

APPENDIX B

Data Summary Forms

DATA SUMMARY FORM: INORGANIC

Page 1 of 5

Case #: 33696

SDG : MC02G9

Number of Soil Samples : 3

Site :

ELKTON FARM FIRE HOLE

Number of Water Samples : 0

Lab. :

LIBRITY

Sample Number :	MC02G9	MC02H6	MC02H7								
Sampling Location :	S1	S2	S3								
Field QC:											
Matrix :	Soil	Soil	Soil								
Units :	mg/Kg	mg/Kg	mg/Kg								
Date Sampled :	12/14/2004	12/14/2004	12/14/2004								
Time Sampled :	12:30	15:30	16:10								
%Solids :	85.8	76.7	79.0								
Dilution Factor :	1.0	1.0/2.0/2.0	1.0								
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	10700		16500		12900					
ANTIMONY	6	1.9	B	9.4	L	1.7	B				
ARSENIC	1	5.5		9.5		4.5					
BARIUM	20	611	J	1960	J	570	J				
BERYLLIUM	0.5	0.46	J	0.65	J	0.80					
CADMIUM	0.5	5.7		13.6		6.5					
CALCIUM	500	1130		5010		2630					
CHROMIUM	1	50.8	L	289	L	30.6	L				
COBALT	5	5.3	J	14.3	J	7.1	J				
COPPER	2.5	407	J	10200 +	J	319	J				
IRON	10	20200		57200		16000					
*LEAD	1	726	J	852	J	295	J				
MAGNESIUM	500	1420		2440		1780					
MANGANESE	1.5	730	J	1260	J	742	J				
MERCURY	0.1	0.22	K	0.41	K	0.098	J				
NICKEL	4	13.4	J	30.2	J	12.6	J				
POTASSIUM	500	504	J	1040		574	J				
SELENIUM	3.5										
SILVER	1	0.43	J	2.2		0.45	J				
SODIUM	500	80.9	B	195	J	137	B				
THALLIUM	2.5	4.5		15.6		3.2					
VANADIUM	5	27.2		30.9		23.8					
ZINC	6	568		4560 +		736					
CYANIDE	2.5	0.21	J	0.95	J	0.42	J				

CRDL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRDL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

"++" = Results are reported from dilution analyses.

DATA SUMMARY FORM: INORGANIC

Page 2 of 5

Case #: 33696

SDG : MC02H2

Number of Soil Samples : 18

Site :

ELKTON FARM FIRE HOLE

Number of Water Samples : 0

Lab. :

LIBRTY

Sample Number :	MC02H2	MC02H3	MC02H4	MC02H8	MC02H9						
Sampling Location :	S10	S11	S12	S4	S5						
Field QC:			Dup. of MC02H9		Dup. of MC02H4						
Matrix :	Soil	Soil	Soil	Soil	Soil						
Units :	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg						
Date Sampled :	1/11/2005	1/11/2005	1/12/2005	1/12/2005	1/12/2005						
Time Sampled :	09:25	11:25	11:25	12:30	11:10						
%Solids :	80.3	83.6	78.3	82.2	82.7						
Dilution Factor :	1.0	1.0	1.0	1.0	1.0						
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	19800		18600		9540		12000		11800	
ANTIMONY	6	0.94	B	1.9	B	2.4	J		UL	2.9	J
ARSENIC	1	4.4	J	4.7	J	3.3	J	3.7	J	4.4	J
BARIUM	20	709	J	992	J	377	J	80.9	J	717	J
BERYLLIUM	0.5	0.60	J	0.57	J	0.42	J	0.81		0.51	J
CADMIUM	0.5	0.36	J	0.27	J	2.8	J		UL	5.0	J
CALCIUM	500	2040		1700		3290		922		3690	
CHROMIUM	1	29.1	J	29.0	J	73.9	J	17.4	J	155	J
COBALT	5	5.5	J	5.6	J	4.5	J	7.1		4.9	J
COPPER	2.5	120	L	60.2	L	223	L	9.2	L	137	L
IRON	10	24400	J	24600	J	19700	J	13900	J	20000	J
*LEAD	1	136	J	122	J	541	J	13.4	J	459	J
MAGNESIUM	500	3050		2430		2690		1440		3220	
MANGANESE	1.5	182	J	167	J	381	J	479	J	453	J
MERCURY	0.1	0.12	J	0.029	J	0.12	J	0.028	J	0.19	
NICKEL	4	14.0	J	12.8	J	13.3	J	9.7	J	18.2	J
POTASSIUM	500	869		729		514	J	408	J	581	J
SELENIUM	3.5		UL		UL	0.38	J		UL		UL
SILVER	1	0.24	J	0.20	J	0.26	J	0.13	J	0.44	J
SODIUM	500	99.8	B	98.5	B	36.9	B	41.2	B	63.3	B
THALLIUM	2.5		UL		UL		UL		UL		UL
VANADIUM	5	41.6		37.8		24.2		23.4		29.5	
ZINC	6	144		110		552		33.2		657	
CYANIDE	2.5		UL		UL	0.85	J		UL	0.73	J

CRDL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRDL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

DATA SUMMARY FORM: INORGANIC

Page 3 of 5

Case #: 33696

SDG : MC02H2

Site :

ELKTON FARM FIRE HOLE

Lab. :

LIBRTY

Sample Number :	MC02J0 ✓	MC02J1 ✓	MC02J2 ✓	MC02J3 ✓	MC02J6 ✓						
Sampling Location :	S6	S7	S8	S9	SS10						
Field QC:											
Matrix :	Soil	Soil	Soil	Soil	Soil						
Units :	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg						
Date Sampled :	1/11/2005	1/11/2005	1/12/2005	1/12/2005	1/11/2005						
Time Sampled :	13:10	15:15	09:10	10:10	10:00						
%Solids :	82.5	81.2	85.2	79.2	80.4						
Dilution Factor:	1.0	1.0	1.0	1.0	1.0						
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	12100		13100		11800		17800		17100	
ANTIMONY	6	0.25	B	1.3	B	0.44	B	0.36	B		UL
ARSENIC	1	3.0	J	3.5	J	3.4	J	5.0	J	3.7	J
BARIUM	20	97.2	J	576	J	26.4	J	52.9	J	52.0	J
BERYLLIUM	0.5	0.76		0.79		0.34	J	0.59	J	0.73	
CADMIUM	0.5		UJ	2.4	J		UJ		UJ		UJ
CALCIUM	500	536	J	1360		492	J	880		747	
CHROMIUM	1	15.0	J	18.7	J	21.6	J	28.4	J	23.7	J
COBALT	5	6.3		5.7	J	2.7	J	4.1	J	7.1	
COPPER	2.5	6.2	L	59.6	L	7.8	L	11.4	L	13.3	L
IRON	10	12000	J	13300	J	18300	J	24600	J	21900	J
LEAD	1	10.3	J	105	J	5.9	J	11.2	J	8.0	J
MAGNESIUM	500	1660		2320		1230		1620		3190	
MANGANESE	1.5	208	J	337	J	50.4	J	121	J	166	J
MERCURY	0.1	0.013	J	0.077	J	0.034	J	0.060	J	0.021	J
NICKEL	4	8.8	J	10.8	J	6.1	J	9.4	J	13.1	J
POTASSIUM	500	332	J	446	J	429	J	583	J	1000	
SELENIUM	3.5		UL		UL		UL		UL		UL
SILVER	1			0.069	J	0.072	J				
SODIUM	500	47.2	B	34.0	B	50.0	B	52.2	B	98.4	B
THALLIUM	2.5		UL		UL		UL		UL		UL
VANADIUM	5	20.6		21.5		29.2		39.5		41.0	
ZINC	6	30.2		1530		20.2		32.1		34.2	
CYANIDE	2.5		UL	2.1	J		UL		UL		UL

CRDL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRDL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

DATA SUMMARY FORM: INORGANIC

Page 4 of 5

Case #: 33696

SDG : MC02H2

Site :

ELKTON FARM FIRE HOLE

Lab. :

LIBRTY

Sample Number :	MC02J7	MC02J8	MC02K1	MC02K2	MC02K3						
Sampling Location :	SS11	SS12	SS4	SS5	SS6						
Field QC:		Dup. of MC02K2		Dup. of MC02J8							
Matrix :	Soil	Soil	Soil	Soil	Soil						
Units :	mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg						
Date Sampled :	1/11/2005	1/12/2005	1/12/2005	1/12/2005	1/11/2005						
Time Sampled :	11:45	11:30	12:40	11:15	13:55						
%Solids :	80.6	75.3	85.9	79.0	84.3						
Dilution Factor :	1.0	1.0/2.0	1.0	1.0/2.0	1.0						
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	15100		32000		3850		16300		4400	
ANTIMONY	6	0.51	B	12.6	L	0.27	B	17.1	L	0.30	B
ARSENIC	1	4.0	J	16.4	J	0.98	J	22.4	J	1.2	J
BARIUM	20	53.0	J	1970	J	12.7	J	2780 +	J	11.3	J
BERYLLIUM	0.5	0.59	J	0.79		0.18	J	1.5		0.27	J
CADMIUM	0.5		UJ	49.3	J		UJ	64.6	J		UJ
CALCIUM	500	616	J	7640		289	J	11500		168	J
CHROMIUM	1	25.1	J	170	J	12.7	J	206	J	12.1	J
COBALT	5	4.8	J	12.1		1.5	J	8.3		1.8	J
COPPER	2.5	11.9	L	871	L	3.7	L	2810	L	5.4	L
IRON	10	23400	J	80800 +	J	6170	J	73400 +	J	9520	J
*LEAD	1	7.9	J	2620	J	3.8	J	2860	J	2.8	J
MAGNESIUM	500	2460		3920		573	J	5270		523	J
MANGANESE	1.5	107	J	1740	J	40.4	J	1720	J	54.4	J
MERCURY	0.1		UL	0.33			UL	0.25			UL
NICKEL	4	10.8	J	60.8	J	3.0	J	41.9	J	3.0	J
POTASSIUM	500	789		634	J	135	J	763		172	J
SELENIUM	3.5		UL	2.2	J		UL	2.6	J		UL
SILVER	1			3.0				3.3			
SODIUM	500	69.1	B	159	J	39.8	B	261	J	35.5	B
THALLIUM	2.5		UL	1.3	J		UL	1.7	J		UL
VANADIUM	5	39.0		26.9		10.8		28.5		14.6	
ZINC	6	27.6		4050 +		10.0		4280 +		19.9	
CYANIDE	2.5		UL	0.73	J		UL	3.8			UL

CRDL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits: (CRDL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

"+" = Results are reported from dilution analyses.

DATA SUMMARY FORM: INORGANIC

Page 5 of 5

Case #: 33696

SDG : MC02H2

Site :

ELKTON FARM FIRE HOLE

Lab. :

LIBRTY

Sample Number :	MC02K4	MC02K5	MC02K6								
Sampling Location :	SS7	SS8	SS9								
Field QC:											
Matrix :	Soil	Soil	Soil								
Units :	mg/Kg	mg/Kg	mg/Kg								
Date Sampled :	1/11/2005	1/12/2005	1/12/2005								
Time Sampled :	15:25	09:15	10:30								
%Solids :	80.3	94.1	91.7								
Dilution Factor :	1.0	1.0	1.0								
ANALYTE	CRQL	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
ALUMINUM	20	17800		989		1050					
ANTIMONY	6	0.32	B	0.22	B	0.22	B				
ARSENIC	1	4.3	J	0.36	J	0.85	J				
BARIUM	20	53.1	J	3.3	J	3.2	J				
BERYLLIUM	0.5	0.66		0.11	B	0.14	J				
CADMIUM	0.5		UL		UL		UL				
CALCIUM	500	544	J	65.9	B	61.9	B				
CHROMIUM	1	24.8	J	11.3	J	14.6	J				
COBALT	5	5.0	J	2.0	J	1.5	J				
COPPER	2.5	12.6	L	3.3	L	3.9	L				
IRON	10	21700	J	5170	J	7850	J				
LEAD	1	8.7	J	1.3	J	1.3	J				
MAGNESIUM	500	3050		90.4	J	107	J				
MANGANESE	1.5	132	J	65.9	J	54.4	J				
MERCURY	0.1		UL	0.031	J	0.10	J				
NICKEL	4	12.7	J	1.1	J	1.1	J				
POTASSIUM	500	831		30.9	J	34.3	J				
SELENIUM	3.5		UL		UL		UL				
SILVER	1										
SODIUM	500	74.8	B	24.2	B	26.7	B				
THALLIUM	2.5		UL		UL		UL				
VANADIUM	5	41.2		6.9		10.6					
ZINC	6	36.1		4.4	B	5.2	B				
CYANIDE	2.5		UL		UL		UL				

CRDL = Contract Required Quantitation Limit

SEE NARRATIVE FOR CODE DEFINITIONS

To calculate sample quantitation limits. (CRDL * Dilution Factor) / (%Solids/ 100)

Revised 09/99

APPENDIX C

Chain of Custody (COC) Records



USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 33696

DAS No: R32050

R

Region: 3	Date Shipped: 12/14/2004	Chain of Custody Record Relinquished By (Date / Time) Received By (Date / Time) 1 2 3 4	Sampler Signature:
Project Code:	Carrier Name: FedEx		
Account Code: 2004T03W302DD2C037ZLA00	Airbill: 843517786097		
CERCLIS ID: MDD985407196	Shipped to: Liberty Analytical Corporation 501 Madison Avenue Cary NC 27513 (919) 379-4100		
Spill ID:			
Site Name/State: ELKTON FARM FIREHOLE FUDS/MD			
Project Leader: Alex Cox			
Action: Expanded Site Investigation/RI			
Sampling Co: MDE-ERRP			

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No/ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME	ORGANIC SAMPLE No.	QC Type
MC02G9	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2612 (Ice Only), 2613 (Ice Only), 2614 (Ice Only) (3)	S1	S: 12/14/2004 12:30		Spike
MC02H6	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2698 (Ice Only) (1)	S2	S: 12/14/2004 15:30		--
MC02H7	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2699 (Ice Only) (1)	S3	S: 12/14/2004 16:10		--

Shipment for Case Complete? N	Sample(s) to be used for laboratory QC: MC02G9	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key: TM + HG = CLP TM + HG	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____

TR Number: 3-592370820-121404-0001

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PR provides preliminary results. Requests for preliminary results will increase analytical costs.

and Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-



USEPA Contract Laboratory Program
Inorganic Traffic Report & Chain of Custody Record

Case No: 33696
DAS No: R32050

R

Region: 3	Date Shipped: 1/12/2005	Chain of Custody Record	Sampler Signature:
Project Code:	Carrier Name: FedEx	Relinquished By (Date / Time)	Received By (Date / Time)
Account Code: 2004T03W302DD2C037ZLA00	Airbill: 850760667177	1	
CERCLIS ID: MDD985407196	Shipped to: Liberty Analytical Corporation 501 Madison Avenue Cary NC 27513 (919) 379-4100	2	
Spill ID:		3	
Site Name/State: ELKTON FARM FIREHOLE FUDS/MD		4	
Project Leader: Alex Cox			
Action: Expanded Site Investigation/RI			
Sampling Co: MDE-ERRP			

INORGANIC SAMPLE No.	MATRIX/ SAMPLER	CONC/ TYPE	ANALYSIS/ TURNAROUND	TAG No./ PRESERVATIVE/ Bottles	STATION LOCATION	SAMPLE COLLECT DATE/TIME		ORGANIC SAMPLE No.	QC Type
MC02H4	Surface Soil (0"-12")/ Philip Anderson	M/G	TM + HG (21)	2696 (Ice Only) (1)	S12	S: 1/12/2005	11:25		Field Duplicate of MC02H9
MC02H8	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2700 (Ice Only) (1)	S4	S: 1/12/2005	12:30		-
MC02H9	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2701 (Ice Only) (1)	S5	S: 1/12/2005	11:10		-
MC02J2	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2704 (Ice Only) (1)	S8	S: 1/12/2005	9:10		-
MC02J3	Surface Soil (0"-12")/ Philip Anderson	L/G	TM + HG (21)	2705 (Ice Only) (1)	S9	S: 1/12/2005	10:10		-
MC02J8	Subsurface Soil (>12")/ Philip Anderson	L/G	TM + HG (21)	2725 (Ice Only) (1)	SS12	S: 1/12/2005	11:30	C02J8	Field Duplicate of MC02K2
MC02K1	Subsurface Soil (>12")/ Philip Anderson	L/G	TM + HG (21)	2740 (Ice Only) (1)	SS4	S: 1/12/2005	12:40	C02K1	-
MC02K2	Subsurface Soil (>12")/ Philip Anderson	L/G	TM + HG (21)	2745 (Ice Only) (1)	SS5	S: 1/12/2005	11:15	C02K2	-
MC02K5	Subsurface Soil (>12")/ Philip Anderson	L/G	TM + HG (21)	2760 (Ice Only) (1)	SS8	S: 1/12/2005	9:15	C02K5	-
MC02K6	Subsurface Soil (>12")/ Philip Anderson	L/G	TM + HG (21)	2765 (Ice Only) (1)	SS9	S: 1/12/2005	10:30	C02K6	-

Shipment for Case Complete? Y	Sample(s) to be used for laboratory QC: MC02H4, MC02J8	Additional Sampler Signature(s):	Chain of Custody Seal Number:
Analysis Key: TM + HG = CLP TM + HG	Concentration: L = Low, M = Low/Medium, H = High	Type/Designate: Composite = C, Grab = G	Shipment Iced? _____

TR Number: 3-592370820-011205-0003

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Send Copy to: Sample Management Office, Attn: Heather Bauer, CSC, 15000 Conference Center Dr., Chantilly, VA 20151-3819; Phone 703/818-4200; Fax 703/818-44

APPENDIX D

Laboratory Case Narrative

EQUATIONS FOR SOLID SAMPLE CALCULATIONS:

Client sample MC02G9 used for illustration.

ICP Equation:

Equation for obtaining metals sample results in mg/Kg as presented on FORM I data sheets from ICP instrument acquired results in $\mu\text{g/L}$ (ppb).

$$\text{Concentration (\% solids) (mg/Kg)} = \frac{C \times V}{W \times S} \times \text{DF}$$

Where

C = concentration ($\mu\text{g/L}$)

DF = dilution factor

V = final volume in liters after sample preparation

W = weight in grams of wet sample

S = % solids/100

Example: calcium result $\mu\text{g/L}$ to mg/Kg.

$$\frac{9671.186 \mu\text{g/L} \times 0.1 \text{ L (V)}}{1.0 \text{ g (W)} \times 0.858} = 1127.2 \text{ mg/Kg reported as } 1130 \text{ mg/Kg}$$

Cyanide Equation:

Equation for obtaining cyanide sample results in mg/Kg as presented on FORM I data sheets from instrument acquired results in $\mu\text{g/L}$ (ppb).

$$\frac{A \times D \times F}{B \times E}$$

Where

A = $\mu\text{g/L}$ CN

B = wet weight of sample

D = dilution factor to bring sample into analysis range

E = % solids/100

F = final volume in liters (0.05 L)

Example: cyanide result $\mu\text{g/L}$ to mg/Kg

$$\frac{3.623335 \mu\text{g/L (A)} \times 1 \text{ (D)} \times 0.05 \text{ L (F)}}{1.00 \text{ g (B)} \times 0.858 \text{ (E)}} = 0.2112 \text{ mg/Kg reported as } 0.21 \text{ mg/Kg}$$

Mercury Equation:

Equation for obtaining mercury sample results in mg/Kg as presented on FORM I data sheets from instrument acquired results in $\mu\text{g/L}$ (ppb).

$$\frac{A \times D \times F}{B \times E}$$

Where

A = $\mu\text{g/L}$ Hg

B = wet weight of sample

D = dilution factor to bring sample into analysis range

E = % solids/100

F = final volume in liters (0.1 L)

Example: mercury result $\mu\text{g/L}$ to mg/Kg

$$\frac{0.3771 \mu\text{g/L (A)} \times 1 \text{ (D)} \times 0.1 \text{ (F)}}{0.2 \text{ g (B)} \times 0.858 \text{ (E)}} = 0.2198 \text{ mg/Kg reported as } 0.22 \text{ mg/Kg}$$

CompuChem

a Division of Liberty Analytical Corp.

501 Madison Avenue Cary, NC 27513

SDG NARRATIVE
CASE # 33696 SDG # MC02H2
CONTRACT # 68W04011

The indicated Sample Delivery Group (SDG) consisting of eighteen (18) soil samples was received on January 12 and 14, 2004. The samples were intact and in good condition with Chain of Custody (COC) Records.

ISSUES:

No. 1- Case 33696 was received with two samples (MC02H4, MC02J8) indicated for QC. LIBRTY selected MC02H4 for QC.

No. 2- Case # 33696 and DAS # R32050 are present on the TR/COCs. LIBRTY notified SMO about the situation.

No. 3- For Case 33696, the Scheduling Notification Form has total metals, mercury, and cyanide. The TR/COC have TM+HG. Per Region 3, LIBRTY is to follow the Scheduling Notification Form.

SAMPLE IDs:

The following customer IDs are associated with this SDG:

MC02H2	MC02H3	MC02H4	MC02H8	MC02H9	MC02J0
MC02J1	MC02J2	MC02J3	MC02J6	MC02J7	MC02J8
MC02K1	MC02K2	MC02K3	MC02K4	MC02K5	MC02K6

The samples were analyzed, in accordance with EPA - CLP Statement of Work (SOW) document ILM05.3 for TAL ICP-AES total metals and mercury including cyanide.

The correlation coefficients for the mercury and cyanide analytical runs are confirmed to be ≥ 0.9950 .

The cooler temperature bottles were present with samples and sample temperatures were 3.1 and 1.9 degrees Celsius.

INSTRUMENTAL QUALITY CONTROL:

All calibration verification solutions (ICV, CCV, & CRI), blanks (ICB, & CCB), and interference check samples (ICSA & ICSAB) associated with this data were confirmed to be within EPA CLP allowable limits.

SAMPLE PREPARATION QUALITY CONTROL:

The sample preparation procedure verifications (LCSS & PBS) were found to be within acceptable ranges and all field samples were prepared and analyzed within the contract specified holding times.

MATRIX RELATED QUALITY CONTROL:

The ICP sample matrix spike, CCN = 57761 (MC02H4S) was found to be outside CLP control limits for antimony and copper. The reported concentrations are flagged with an "N" on all associated Form 1 and on Form 5a.

The mercury sample matrix spike, CCN = 57765 (MC02H4S) was found to be inside CLP control limits.

The cyanide sample matrix spike, CCN = 57666 (MC02H4S) was found to be inside CLP control limits.

The ICP sample matrix duplicate, CCN = 57760 (MC02H4D) was found to be outside CLP control limits for arsenic, barium, beryllium, cadmium, chromium, iron, lead, manganese, and nickel. The reported concentrations for these analytes are flagged with a "*" on all associated Form 1 and on Form 6.

The mercury sample matrix duplicate, CCN = 57764 (MC02H4D) was found to be inside CLP control limits.

The cyanide sample matrix duplicate, CCN = 57665 (MC02H4D) was found to be inside CLP control limits.

A five-fold serial dilution of sample, CCN = 549009 (MC02H4L) was performed in accordance with CLP requirements for ICP analysis.

The adjusted sample concentrations were inside CLP control limits for the requested analytes.

The laboratory manager or his designee, as verified by the following signature has authorized release of the data contained in this hard copy data package.



Thomas R. Cole
Data Reviewer II
January 31, 2005



NAEVA GEOPHYSICS INC.

THE LEADER IN SUBSURFACE DETECTION

Subsurface Geophysical Surveys

GPR
MAGNETICS
ELECTROMAGNETICS
SEISMICS
RESISTIVITY
UTILITY LOCATION
LEAK DETECTION
BOREHOLE CAMERA
STAFF SUPPORT

Results of Geophysical Investigation

Former Triumph Explosives Facility
Zeitler Road
Elkton, Maryland

Prepared for: ENSAT Corporation
Jessup, Maryland

Dates of Investigation: July 15-16, 2004

Introduction

Background

Survey Design

Methods

Results / Conclusions

Recommendations

Plate 1 Analytic signal from corrected total field magnetic intensity contour map
Plate 2 EM-31 Conductivity contour map
Plate 3 EM-31 Inphase contour map

MARYLAND

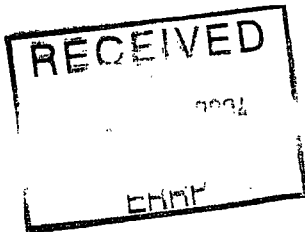
7777 Benson Ave.
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(410) 536-7602 Fax

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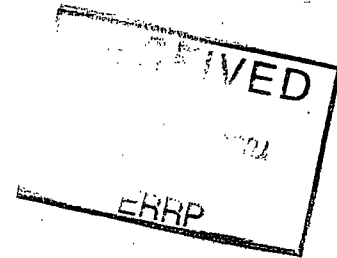
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**Results of Geophysical Investigation
Former Triumph Explosives Facility
Zeitler Road
Elkton, Maryland**



Introduction

On July 15-16, 2004, NAEVA Geophysics, Inc. conducted geophysical investigations on a portion of a former rocket testing station operated by the Triumph Explosives Company. The site was located on Zeitler Road in Elkton, Maryland. The purpose of this investigation was to determine the boundaries of suspected burial trenches and burn pits by expanding the target area mapped by NAEVA in July of 2002, in which the attempt was made to delineate any burial trenches, burn pits, or underground storage tanks (USTs) that may exist at the site.

Background

The area of investigation (Plates 1-3) encompassed approximately 12 acres of land currently used as farmland planted with soybeans. The area is bordered on the south side by forest and on the north side by Zeitler Road. The planted fields extend several thousand feet to the west (previously mapped) and several thousand feet to the east.

In July of 2002, NAEVA conducted a survey on approximately 30 acres of land to the west of the current investigation area. The majority of their survey grid was constructed of parallel lines spaced 25 feet apart. However, two mini-grids were also constructed of parallel lines spaced 10 feet apart. The results of the earlier survey suggest the presence of burial trenches containing metallic waste within the northern mini-grid. In addition, by using a TW-6 metal detector, they found four significant metallic anomalies that can be characterized as possible USTs.

Survey Design

NAEVA utilized GPS to establish limits of the old survey areas and the boundaries of the new area. Tape measures were used to extend the area of investigation to the edge of the woods on the south and west. Local coordinates were later converted to Maryland State Plane coordinates. The survey grid was constructed of parallel lines spaced 25 feet apart. Data was collected along all survey lines at 5-foot station intervals.

The grid for this investigation extends from the previous grid approximately 270 feet south (from 654000 North to 653730 North) and 500 feet east (from 1117570 East to 1118070 East) in an irregular pattern as dictated by the woods along the southern and western margins. The remainder of the grid is comprised of approximately 9 acres of land that stretches from 1117860 East to 1118060 East and from 654000 North to 656000 North.

Methods

The equipment selected for this investigation included an Ashtech Z-FX GPS system consisting of a base station and a mobile rover, a Compaq Aero 2150 Palm-size PC (utilized to run GPS software), a Scintrex Smart-Mag cesium vapor magnetometer (utilized for field data collection), a Scintrex Envi-Mag proton-precession magnetometer (utilized for monitoring diurnal drift), and a Geonics EM-31 DL terrain conductivity meter.

NAEVA utilized an Ashtech Z-FX Surveyor RTK (Real Time Kinematic) GPS system to collect positional data. The system employs a GPS base station (Ashtech Z-FX receiver), which can be set up on a known control point, or can compute its position autonomously. A roving GPS antenna connected to another Z-FX receiver is used to collect positional data for the desired points. Real time corrections are broadcast to the roving GPS unit via a radio link. This system provides positional updates at a rate of 1 Hz, which an accuracy of 3-cm horizontal, 5-cm vertical, when a minimum of 5 satellites are available.

For this area of investigation there was no known base point from which the boundaries of the grid area could be surveyed. Therefore, NAEVA set an autonomous base position and used a rover to establish the boundaries of the new survey area. Throughout the course of the day, more autonomous base positions were collected in order to establish confidence in the base position. The average of the collected base positions was used to re-survey the grid boundaries, yielding greater accuracy for the grid layout.

Magnetometers are useful in locating the buried ferrous materials typically found in disposal areas. The earth's magnetic field drifts over the course of a day. Therefore, a base station was employed to collect continuous readings at 6-second intervals documenting any diurnal drift. Corrections can then be made to the field magnetometer readings to correct for this drift. Total field intensity readings consisting of the earth's primary magnetic field as well as the response from any secondary fields generated by local ferromagnetic materials in the subsurface were collected over the survey area and stored in a portable data logger. These readings, measured in nanoTeslas

(nT), were downloaded to a personal computer, corrected for diurnal drift, and contoured using the calculated analytic signal.

The EM31 consists of boom-mounted coplanar electromagnetic transmitter and receiver coils that are mounted at a fixed distance of 12 feet. Data is collected and stored in a digital data recorder attached to the instrument. A current applied to the transmitter coil produces a time-varying magnetic field, which induces small secondary currents within the earth. These currents generate a secondary magnetic field, which is detected along with the primary field by the receiver coil. The EM31 was carried at a height of 3-feet and operated in the vertical dipole mode, where the greatest portion of the instrument response is affected by material in the 3 to 9-foot depth range. The maximum useful depth of exploration of the EM31, according to the manufacturer, is approximately 18 feet.

The EM31 provides an output of both the quadrature-phase (terrain conductivity) and in-phase (response to metal) components of an induced electromagnetic field. The quadrature-phase is a measurement of terrain conductivity in milliSiemens per meter (mS/m). Terrain conductivity is a function of porosity, degree of saturation, and the conductivity of subsurface materials. The absolute values of terrain conductivity are not usually diagnostic, but their spatial variations are important. The ability to identify lateral variations in the shallow subsurface makes quadrature-phase EM31 data very useful in the delineation of burial features.

The inphase component of the EM31 data is primarily used in searching for buried metal, and is measured in units of relative parts per thousand (ppt) of the magnetic field. A negative instrument response is typical over areas containing shallow buried metal (both ferrous and nonferrous). The data were collected in an integrated data logger located at the center of the EM31 instrument. Later, the data was downloaded to a computer, processed, and contoured. Final presentation quality maps of all digital geophysical data were produced using Geosoft's Oasis Montaj software.

Results / Conclusions

The results of the geophysical investigation reveal one major anomalous magnetic and in-phase EM response. Referring to the contoured analytic signal data (Plate 1), the center of the anomaly is located at approximately 1117900 East, 653970 North. The dimensions of this feature stretch 150 feet from East to West and 175 feet from Northeast to Southwest. This feature also shows up clearly on the contoured inphase data (Plate 3), suggesting a large metallic feature located beneath the surface.

Referring to the analytic signal data in Plate 1, there are several parameters of the buried anomaly, such as size, orientation, and magnetic characteristics that cause the deviation in the earth's magnetic field around the object. Therefore, although the location of the anomaly can be pinpointed with great accuracy, the exact structure and composition are difficult to infer. However, the object in our survey does not appear to represent a burial trench as found in the investigation carried out in July 2002. It is also not likely that the object is a burn pit based on the large dipole response evident on the contoured analytic signal data. This type of response is typically characteristic of an object with a more structured composition.

Referring to the conductivity data in Plate 2, the anomalous feature pointed out in plates 1 and 3 is represented by a small, but noticeable response coinciding with the locations on the other two maps. The remainder of the grid area is relatively free of any significant conductivity response. There are slightly elevated areas of conductivity located from 1117850 East to 1118050 East, and from 654120 North to 654330 North. These changes, as well as the variation in conductivity throughout the remainder of the grid, can most likely be attributed to natural geologic features in the subsurface. It should be noted that the soil moisture content was very high overall, and varied from being slightly moist at the surface to having substantial water standing on the surface due to supersaturated conditions caused by heavy rainfall.

Recommendations

For the one item of interest found, NAEVA recommends an intrusive investigation commencing at the center of the feature. Further examination should be directed outwards to fully characterize the anomaly.



September 3, 2002

Mr. Karl Kalbacher, Administrator
Environmental Restoration and Redevelopment Program
Maryland Department of the Environment
1800 Washington Blvd., Suite 625
Baltimore, Maryland 21230-1719

Re: Triumph Explosives Site
Zeitler Road
Elkton, Maryland
ENSAT Project No. C02-1580

Dear Mr. Kalbacher:

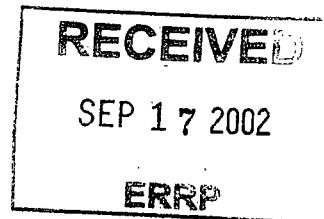
Environmental Service and Technology Corporation (ENSAT) is pleased to provide you with the following Geophysical Investigation Summary report for the above-referenced site. The report summarizes our investigation utilizing various technologies associated with geophysical surveying. An outline of services performed (complete with an explanation of the technology used), as well as conclusions and future recommendations are provided.

INTRODUCTION

The Triumph Explosives (site) is located on Zeitler Road in Elkton, Maryland. The site is situated south of Zeitler Road and is currently used for agricultural purposes. Topography on the site is relatively flat with a wooded area bordering the property to the west and a dirt access road that bisects the site running north to south. A partially wooded area containing concrete and steel structures is located in the south-central portion of the site. A large diameter steel high-tension power-line tower is located in this area of the site, as well. The investigation included site clearing, survey flag placement, and geophysical surveying.

SITE PREPARATION

On July 10, 2002, ENSAT representatives mobilized on-site to perform necessary site clearing and to survey the location of the grids. Site clearing was performed with a rubber-tired backhoe in the areas surrounding the concrete structure and the wooded boundary line to the west of this structure. The survey grid encompasses an area of approximately 2,500 feet by 600 feet and runs perpendicular to Zeitler Road, in a north-south direction. This larger grid was completed with a 25 foot line spacing. A dirt road bisects the grid area meandering through the center of the grid on a north-south axis. Within the large grid, two (2) smaller and tighter grids were surveyed. The first of these two smaller grids is located in the northwestern portion of the larger grid and was completed with a 10 foot line spacing. The placement of this grid was based on the review of existing historical documentation and area topographic depressions located to the west of the dirt access road. The second of these smaller grids was located in the southernmost portion of the larger grid and was also completed with 10 foot line spacing. The placement of this grid was based on the review of existing historical documentation and distressed vegetation within this area located to the south of the dirt access road. All grids were surveyed in-place using a transit and tripod with corrections using a 100-foot tape measure and compass. At each reference point along the survey lines, a surveyor's flag was placed into the ground.



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The purpose of locating the grid areas was to provide NAEVA Geophysics, Inc. (NAEVA) of Charlottesville, Virginia, the geophysical subcontractor, the base datum upon which to measure and record their geophysical survey data at consistent 5-foot intervals.

TECHNOLOGY

NAEVA conducted geophysical surveys using four (4) separate technologies. The first utilized an Ashtech Z-FX GPS system to collect positional data points such as the location of the grid corners, all road features, buildings, and other significant cultural features. Second, a magnetometer was utilized for the purpose of locating buried ferrous materials. Third, a Geonics EM-31, electromagnetic frequency domain unit was used to measure terrain conductivity. Additionally, an in-phase component of the EM-31 was used to search primarily for buried metal. The last was the TW-6 split-box electromagnetic metal detector used for the purpose of further clarifying near-surface ferrous metal objects. This last technology was used only in the vicinity of the concrete structure and gantry area. All technologies used are further explained, in detail, in the attached NAEVA geophysical report.

CONCLUSIONS

Based on historical information, aerial photographs, site reconnaissance, and an extensive geophysical survey; ENSAT has concluded that there are three (3) areas of potential concern that warrant further investigation. All historical information indicates there were burnpits used by Triumph Explosives during 1940s to burn-off thinly spread layers of propellants and fuels. These burnpits were presumed to be located in the northwestern portion of the site and in the southern portion of the site. Indeed two (2) anomalies were located in the northwestern portion of the site, just west of the dirt road, within the 10-foot spaced grid. No significant anomalies were located in the southern 10-foot spaced grid.

Another "trench-like" anomaly, as indicated by the EM-31 Inphase (Plate 3) of the attached NAEVA report, is located between coordinates 655600 and 655400 oriented in a north to south direction, approximately 150 feet in length by approximately 25 feet in width. This particular anomaly lays partially within the northern 10-foot spaced grid and partially within the larger 25-foot spaced grid, just to the east of the dirt road.

There also exists a third anomaly, located in the northwestern portion of the site that travels in an east to westerly direction and is approximately 100 feet in length. This anomaly mimics a potential subsurface utility and verification of this presumption is recommended.

Several (four) subsurface metallic anomalies were detected by the TW-6 metal detector method in the vicinity of the concrete structure and gantry (see CADD). Based on their extensive experience in the industry, NAEVA believes these anomalies are consistent with underground storage tanks (USTs) or similar objects of concern. The location of these anomalies is indicated in NAEVA's report.

RECOMMENDATIONS

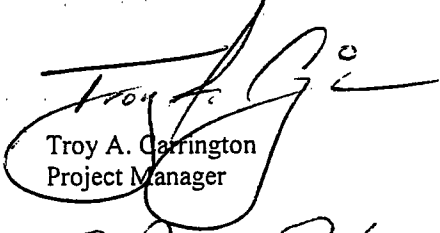
Based on our review of the initial geophysical investigation, ENSAT proposes the following measures in the attempts to further qualify existing data and to provide additional interpretive field data upon which to recommend our next course of action.

1. Utilize electromagnetic utility locators in the vicinity of the northwestern-most anomaly to determine whether the initial readings indicated an underground utility.

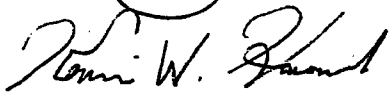
2. Further investigation of the eastern "trench-like" anomaly is recommended to include establishing a grid with 10-foot line spacing to completely define the extent of this anomaly. This particular anomaly extends in a north to south direction (east of the dirt access road) and is situated partially in the 10-foot grid and extends into the 25-foot grid.
3. Obtain ground penetrating radar (GPR) profiles over each of the four (4) TW-6 metal detector anomalies. The concern here is the possible presence of USTs.

ENSAT appreciates the opportunity to provide these services to the Department and looks forward to our continued partnership. Should you have any questions or comments, please contact either Mr. Kevin Howard or myself at (410) 724-5085, ext. 109.

Sincerely,
ENSAT CORPORATION



Troy A. Carrington
Project Manager



Kevin W. Howard
Program Manager

Cc: Mark Cox, MDE Project Manager
Art O'Connell, MDE State Superfund Division Manager

Attachment: NAEVA Geophysical Report



NAEVA GEOPHYSICS INC.

THE LEADER IN SUBSURFACE DETECTION

Subsurface Geophysical Surveys

GPR
MAGNETICS
ELECTROMAGNETICS
SEISMICS
RESISTIVITY
UTILITY LOCATION
UXO DETECTION
BOREHOLE CAMERA
STAFF SUPPORT

Results of Geophysical Investigation

Former Triumph Explosives Facility
Zeitler Road
Elkton, Maryland

Prepared for: ENSAT Corporation
Jessup, Maryland

Dates of Investigation: July 16-19 & 23, 2002

Prepared by:

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Introduction

Background

Survey Design

Methods

Results / Conclusions

Recommendations

Plate 1 Analytic signal from corrected total field magnetic intensity contour map
Plate 2 EM-31 Conductivity (Quadrature Phase) contour map
Plate 3 EM-31 Inphase contour map

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**Results of Geophysical Investigation
Former Triumph Explosives Facility
Zeitler Road
Elkton, Maryland**

Introduction

On July 16 through 19 and July 23, 2002, NAEVA Geophysics, Inc. conducted geophysical investigations on a portion of a former rocket testing station operated by the Triumph Explosives Company. The site was located on Zeitler Road in Elkton, Maryland. The purpose of the investigation was to attempt to delineate any burial trenches, burn pits, or underground storage tanks (USTs) that may exist at the site.

Background

The area of investigation (Plates 1-3) encompassed approximately 30 acres of land currently used as farmland planted with soybeans. The area is bordered on the west side by forest and on the north side by Zeitler Road. The planted fields extend from the grid several hundred feet to the south, and several thousand feet to the east. In the center of the investigation area is an abandoned building, several foundations, a metal gantry, and numerous scrap piles. These cultural features were reported to be the remains of the abandoned rocket testing facility. The possibility exists that this facility may have maintained USTs. Aerial photo evidence supplied by ENSAT suggests that there might have been burn pits or disposal trenches at locations north and south of the facility.

Survey Design

A survey grid was established by ENSAT from a designated control point (0 East, 2000 North) located in the extreme northwestern corner of the survey area. Local coordinates were later converted to Maryland State Plane coordinates, with the grid extending from 1117275 East to 1117825 East and from 654000 North to 656000 North. The majority of the survey grid was constructed of lines spaced 25 feet apart. Two mini-grids of lines spaced 10-feet apart were established in areas suspected to contain burn pits. One mini-grid was located at the north end of the survey area from 1117325 to 1117725 East, and 655500 to 656000 North. The second mini-grid was located at the southern end from 1117650 to 1117800 East

and 654000 to 654500 North. Data were collected along all survey lines at 5-foot station intervals.

Methods

The equipment selected for this investigation included an Ashtech Z-FX GPS system, a Scintrex Smart-Mag cesium vapor magnetometer (utilized for field data collection), a Scintrex Envi-Mag proton-precession magnetometer (utilized for monitoring diurnal drift), a Geonics EM-31 DL terrain conductivity meter, and a Fisher TW-6 split-box metal detector.

NAEVA utilized an Ashtech Z-FX Surveyor RTK (Real Time Kinematic) GPS system to collect positional data. The system employs a GPS base station (Ashtech Z-FX receiver), which can be set up on a known control point, or can compute its position autonomously. A roving GPS antenna connected to another Z-FX receiver is used to collect positional data for the desired points. Real time corrections are broadcast to the roving GPS unit via a radio link. This system provides positional updates at a rate of 1 Hz, with an accuracy of 3-cm horizontal, 5-cm vertical, when a minimum of 5 satellites are available. The GPS system was used to record the locations of grid corners, roads, buildings, and other significant cultural features.

Magnetometers are useful in locating the buried ferrous materials typically found in disposal areas. Because the earth's magnetic field drifts over the course of a day, a base station was employed to collect continuous readings at five-second intervals documenting any diurnal drift so that corrections to survey data could be made. Total field intensity readings, the sum of the earth's primary magnetic field plus the response from any secondary fields generated by local ferromagnetic materials in the subsurface, were collected over the survey area and stored in a portable data logger. These readings, measured in nanoTeslas (nT), were downloaded to a personal computer, corrected for diurnal drift, and contoured.

The Geonics EM-31 is an electromagnetic (EM) frequency domain instrument primarily used to measure terrain conductivity. The EM-31 provides an output of both the quadrature-phase (terrain conductivity) and in-phase (response to metal) components of an induced electromagnetic field. The quadrature-phase is a measurement of terrain conductivity in milliSiemens per meter (mS/m). Terrain conductivity is a function of porosity, degree of saturation, and the conductivity of subsurface materials. The absolute values of terrain conductivity are not usually diagnostic, but their spatial variations are important. The ability to identify lateral

variations in the shallow subsurface makes quadrature-phase EM-31 data very useful in the delineation of burial features.

The inphase component of the EM-31 data is primarily used in searching for buried metal, and is measured in units of relative parts per thousand (ppt) of the magnetic field. A negative instrument response is typical over areas containing shallow buried metal (both ferrous and nonferrous). The data were temporarily stored in a palm-top data logger and then downloaded to a laptop computer, processed, and contoured. Final presentation quality maps of all digital geophysical data were produced using Geosoft's Oasis Montaj software.

The TW-6 is a split-box electromagnetic metal detector that is very sensitive to near surface ferrous metal objects. The TW-6 responds with an audible tone and is useful for accurately tracing the surface expression of buried ferrous objects such as UST's. Negative influence from buildings, scrap metal piles, and large brush piles made the area of the abandoned building and gantry unsuitable for investigation using the EM-31 or magnetometer. Therefore, the TW-6 was used in this area in a reconnaissance investigation for evidence of buried metallic objects that could represent underground storage tanks (USTs) or other subsurface features. The instrument was carried along bi-directional traverses spaced approximately three feet apart across this area. The locations of identified anomalies were painted on the ground using pink spray paint. The findings of the TW-6 survey were mapped in the field and are presented on Plates 1, 2, and 3.

Results / Conclusions

Anomalous magnetic and in-phase EM responses indicate the presence of metallic materials in the subsurface at several locations within the grid. Referring to the contoured analytic signal data (Plate 1), two parallel north-south trending anomalies are evident within the northern mini-grid and centered near coordinates 1117550 East and 655775 North. NAEVA suspects these anomalies may represent burial trenches containing metallic waste. Interestingly, the contoured conductivity and inphase data (Plates 2 and 3, respectively) suggest this area of anomalous response may indeed represent a total of four parallel trench-like features. The inphase data also contains a north-south trending anomaly located near 1117615 East, from 655400 to 655550 North. Although this feature appears to be less significant than those further north, its character is nonetheless suggestive of a burial trench containing metallic material.

Other anomalous inphase and magnetic responses are evident that in NAEVA's opinion can be attributed to cultural features. One large anomaly was identified in all three sets of contoured data, centered near 1117560 East, 654760 North. This corresponds with the presence of a large high voltage electrical tower. A second anomaly that is evident in both magnetic and conductivity data, trends east-west and is located in the upper northwest corner of the area of investigation. This anomaly extends from 1117275 to 1117350 East, along 655940 North. It is unclear whether this feature may represent a burial trench or possibly an underground utility line. The fact that it was not detected in the inphase data suggests that it may be a narrow feature such as a utility.

Referring to the terrain conductivity data in Plate 2, a large area of elevated conductivity extends north from the abandoned building to the suspected burial trenches in the northern mini-grid. There are no magnetic anomalies that correspond with this feature. However a weak response can be seen in the inphase data. While the possibility exists that this response could be due to a broad environmental condition such as a subsurface contaminant plume, there is no supporting evidence that such a problem may exist. More likely, this anomaly is due to a naturally occurring geologic feature such as a water table which becomes increasingly shallow to the southwest. Supporting this possibility is the presence of a streambed that was observed approximately 40 feet west of the area of investigation. Another geologic possibility is that the subtle peaks and valleys in the contoured data may correspond to topography and thus variations in soil development across the site.

The TW-6 metal detector survey in the area of the building and gantry resulted in a total of four significant metallic anomalies that are not explained by above ground cultural features. Each anomaly can be considered a possible UST. These anomaly locations are presented on all of the accompanying plates and are described individually below:

A six-foot by 20-foot rectangular anomaly was identified inside a stand of trees at approximately 1117660 East, 654565 North. A concrete pad was found beneath the leaves at this location. While the response may be due to reinforcement within the pad, it is also possible that a UST is present beneath the pad.

A "T"-shaped anomaly was identified extending from the southwest side of the abandoned building. This narrow anomaly extends approximately 30 feet southwest, where it merges with a rectangular anomaly approximately 10 feet by 20 feet. The

rectangular portion of this anomaly is oriented parallel to the building.

A third metal detector anomaly was identified north of the building near 1117575 East, 654640 North. This anomaly is roughly rectangular in shape, approximately six feet by 30 feet, and oriented northwest-southeast.

The fourth anomaly is located at 1117550 East, 654710 North. This anomaly is roughly circular in shape and eight feet in diameter. A liquid-filled depression was observed in the center of this anomaly.

Recommendations

In order to better characterize the nature of several of the identified anomalies, NAEVA makes the following recommendations:

To further resolve the north-south inphase anomaly centered near 1117615 East, from 655400 to 655550 North, NAEVA recommends establishing a 150 by 100-foot mini-grid over this area consisting of lines spaced 10 feet apart.

NAEVA recommends the use of electromagnetic utility locators to establish whether the linear anomaly observed in the northwestern corner of the grid is indeed a utility or a possible burial trench.

NAEVA recommends the collection of ground penetrating radar (GPR) profiles over each of the four TW-6 metal detector anomalies. The GPR profiles would be inspected for reflections characteristic of UST's.

Finally, NAEVA recommends that additional soil and groundwater samples be taken in and around the area of elevated conductivity. Further information regarding soil types and compaction, and groundwater elevation and contamination may help to determine a possible cause for the anomalously high conductivity over this area.

1117500 1117525 1117550 1117575 1117600 1117625 1117650 1117675

654700 654675 654650 654625 654600 654575 654550

Metal Detector Anomaly
w/ Flooded Hole at Center

Brush/
Trees

Corrugated
Roof Tiles

Metal Detector
Anomaly

Brush/
Trees

Building

Foundation w/ Possible
Sump in Center

Gantry

Metal Detector
Anomaly

Gantry

Foundation

Reinforced
Concrete Pad

Utility
Pole

Brush/
Trees

1117500 1117525 1117550 1117575 1117600 1117625 1117650 1117675

Scale 1:360

25 0

US survey foot

NAD83 / Maryland State Plane

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Dates of Survey: July 15-17, 2002